1985 Research Catch and Effort Data on Nearshore Reef-fishes in the Strait of Georgia B.C. (Statistical Areas 15 and 16)

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December 1985

Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1851

86-01958/

Canadian Manuscript Report of Fisheries and Aquatic Sciences

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Canadian Manuscript Report of
Fisheries and Aquatic Sciences No. 1851

December 1985

1985 RESEARCH CATCH AND EFFORT DATA ON NEARSHORE REEF-FISHES IN THE STRAIT OF GEORGIA B.C. (STATISTICAL AREAS 15 AND 16)

by

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Cat. No. Fs 97-4/1851E ISSN 0706-6473

Correct citation for this publication:

Richards, L. J. and A. J. Cass. 1985. 1985 catch and effort data on nearshore reef-fishes in the Strait of Georgia B.C. (statistical areas 15 and 16). Can. MS Rep. Fish. Aquat. Sci. 1851: 68 p.

ABSTRACT

Richards, L. J. and A. J. Cass. 1985. 1985 catch and effort data on nearshore reef-fishes in the Strait of Georgia B.C. (statistical areas 15 and 16). Can. MS Rep. Fish. Aquat. Sci. 1851: 68 p.

In 1984 we began a research program based on the need for stock assessments of nearshore reef-fishes in the Strait of Georgia. The 1985 results are presented in this report, and are compared with the 1984 results and with a small sample from the recreational fishery. Research CPUE data were collected by angling with trolling rods and reels, using frozen herring as bait. Three depth intervals (5-40 m, 41-70 m, and 71-100 m) were fished at most of the 17 sites. CPUE (for all species combined) depended on surface current. However, time of day, depth, weather conditions, sea state and tide did not affect CPUE. Dogfish, copper rockfish, quillback rockfish, yelloweye rockfish and lingcod were the dominant species in the catch. Species composition varied significantly with depth and statistical area, with proportionately more dogfish and yelloweye rockfish, and proportionately fewer quillback rockfish caught in statistical area 15 than in statistical area 16. Compared with the 1984 catch data, there was a significant decrease in the size of copper rockfish and quillback rockfish in 1985. There was no difference in the size of quillback rockfish in the recreational and 1985 research catch, although larger lingcod were sampled from the recreational fishery.

RESUME

Richards, L. J. and A. J. Cass. 1985. 1985 catch and effort data on nearshore reef-fishes in the Strait of Georgia B.C. (statistical areas 15 and 16). Can. MS Rep. Fish. Aquat. Sci. 1851: 68 p.

En 1984 nous avons entrepris un programme de recherce fondé sur la nécessité d'évaluer le stock de poissons de roche vivant le long des côtes du détroit de Géorgie. Les résultats des recherches de 1985 sont présentés dans ce rapport et comparés avec les résultats de 1984 et avec ceux d'un petit échantillon de la pêche récréative. Les données de recherche sur les prises par unité d'effort (PPUE) ont été rassemblées en pratiquant la pêche à la traîne, avec du hareng congelé comme appât. Cette pêche a été pratiquée à trois intervalles de profondeur (5-40 m, 41-70 m, et 71-100 m) à la plupart des 17 sites. Les PPUE (pour toutes les espèces combinées) ont varié selon l'importance des courants de surface. Toutefois, l'heure de la pêche, la profondeur, les conditions atmosphériques, l'état de la mer ou de la marée n'ont eu aucune influence sur les PPUE. L'aiguillat, le sébaste cuivré, le sébaste à dos épineux le sébaste aux yeux jaunes et la morue-lingue ont été les principales espèces capturées. La composition des prises variait fortement avec la profondeur et l'aire statistique, proportionnellement plus d'aiguillats et de sébastes aux yeux jaunes et moins de sébastes à dos épineux étant pris dans l'aire statistiques 15 que dans l'aire statistique 16. En comparant les données, nous avons constaté que les sébastes cuivrés et les sébastes à dos épineux étaient beaucoup plus petits en 1985 qu'en 1984. Il n'y avait pas de différence de taille entre les sébastes à dos épineux de la zone de pêche récréative et de la zone de recherche de 1985, mais les morues-lingues étaient plus grandes dans l'échantillon de la zone de pêche récréative.

INTRODUCTION

This report summarizes research catch and effort data on nearshore reef-fishes collected during 1985 as part of a stock assessment program for these fishes. We also compare 1985 data with 1984 data, and with data from the recreational fishery. Work was conducted in the Strait of Georgia, in statistical areas 15 and 16. We used angling techniques that had been developed at the same sites during 1984, the first year of the program (Richards et al. 1985a). The sites had also been surveyed during 1984 with the submersible PISCES IV (Richards and Cass 1985) and by SCUBA (Richards et al. 1985b), and during 1985 by SCUBA (Richards et al., in prep.). The objectives of the 1985 angling work were to obtain research fishing data to (1) compare with observations made by PISCES and SCUBA, (2) compare with catch data from the recreational fishery, (3) examine inter-annual variability in angling CPUE among sites, (4) examine among-site differences that may be related to exploitation, and (5) in conjunction with PISCES and SCUBA results, estimate relative abundance, species composition and the size distributions of rockfish and lingcod in these areas.

METHODS

Fishing sites in statistical areas 15 and 16 (Fig. 1) are described in Richards et al. (1985a,b) and Richards and Cass (1985). The area 15 sites were surveyed from June 11 - 20, 1985 using CABEZON, a 12-m herring skiff equipped with an echo sounder. The area 16 sites were surveyed from July 7 - 18, 1985 using CABEZON. Because of weather conditions, we were unable to obtain sufficient data for sites 16-102 and 16-113 during the July survey. These sites were visited on September 4, 1985 by small vessel during a G.B. REED cruise through the area. A depth sounder was not available at this time.

Fishing techniques were identical to those decribed in Richards et al. (1985a) for angling with bait herring using trolling rods and reels. The line was 9-kg test filament with a 7-kg test leader. Mooching weights were added, depending on depth and current. Fishing was discontinued if it was not possible to reach bottom with a 170-g weight. We used two single sharpened hooks of the same size (Mustad #92553, size 3/0 or 2/0, or #92554, size 1/0) with a 6-cm spacing between hooks. The bait used was 12-cm frozen herring. Generally, the anchor was not set and the boat was allowed to drift.

Sites were defined as 1 min latitude by 1 min longitude blocks (see Richards et al. 1985a). Sampling was further stratified by depth within a site. There were three depth intervals: 5-40 m, 41-70 m and 71-100 m. Most recreational rockfish fishing is restricted to the first two depth intervals, but commercial rockfish fishing does occur in the deep interval.

The exact location of fishing within a site block was arbitrary. Upon arrival at a site we used an echo sounder to locate rocky terrain and began to fish according to the following rules:

1. If no fish are caught in the first 5-10 min then move to a new location within the site, otherwise remain at the location.
2. If the CPUE drops, such that no fish were caught in the previous 10 min, then move to a new location.
3. If the catch is predominantly dogfish, then move to a new location.
4. If ten fish of one species are caught, then move to a new location to avoid over-exploitation of a local area.
5. Move to a new location for the start of a new record.

Each record represented a combined fishing effort of at least 0.5 h, unless it became necessary to stop fishing for reasons stated above, or because of weather conditions. We attempted to return to each depth interval at a site on at least two days, for a total fishing effort of 2-3 h. There were always three anglers, each with one line, except for the September date when there were only two anglers.

Fishing effort was defined as the sum of the fishing times of each angler. Fishing time was measured by each angler with a stopwatch. Fishing time included the time that the line was in position near the bottom until the time that either a fish was hooked or the line was hauled in. Unlike the definition of fishing time used in 1984, the time for setting the line was not included. Stopwatches were not used in 1984.

A catch was recorded if the fish was brought to at least a depth at which it could be visually identified. Hence, "bites" or "nibbles" were not recorded if the fish was not held on the hook. All landed rockfish and most lingcod were measured for fork length, sex and maturity. Otoliths were collected from all rockfish and fin rays were collected from most lingcod. Conductivity, temperature and depth were recorded for most fishing days at a site with an Applied Microsystems CTD-12. The conductivity ratio was converted to practical salinity using the algorithm in Folonoff and Millard (1983).

RECREATIONAL DATA

Whenever possible we sampled landed catch from the recreational fishery for species, length, sex and maturity information. Samples from statistical area 16 were collected at Duncan Cove Marina, Garden Bay. We were unable to collect samples from statistical area 15.

RESULTS AND DISCUSSION

RAW DATA

Raw data are presented in Appendices 2, 4 and 5. Appendix 1 describes codes used in Appendix 2. Appendix 2 summarizes the data collected on individual records over the field season, including time, location and depth of fishing, weather conditions, and the number of fish caught of each species. Fishing time is reported as the sum of the fishing times of each angler. Appendix 3 describes rockfish and lingcod maturity codes. Data on individual fish are presented in Appendix 4 for the research data and Appendix 5 for the recreational data. Recording errors were made in length or weight for some fish listed in Appendix 4, as is obvious from plots of the weight-length data. These cases are identified and then excluded from further analysis.

VARIATION IN CPUE

To summarize catch and effort data, total fishing times and the number of fish caught are summed over records for each depth interval at each site (Table 1). CPUE ranged from 0 to 13.09 fish h^{-1}. However, dogfish were an important component of the catch in some areas. CPUE for rockfish ranged from 0 to 9.82 fish h^{-1}. There were two sites with zero rockfish catch within a given depth interval. In both of these cases, CPUE is based on one record and a total fishing time of less than 1 h. The lack of catch probably reflects the low sample size. CPUE with bait herring was higher in 1985 than in 1984 (Richards et al. 1985a) for 75% of the comparable sites and depths ($n=40$, $p<0.01$, sign test), in part due to the different method of recording fishing time. A learning effect may have also led to the increase in CPUE, as the same anglers participated in the second year.

There are many factors that could account for variation in CPUE data. We tested for the effects of time of day, depth, weather conditions, sea state, surface current and tide using Kruskal-Wallis tests on CPUE data from records with a total fishing time of at least 0.5 h. Tests were repeated for combined rockfish CPUE, combined rockfish and lingcod CPUE and total CPUE. With the exception of surface current, none of the effects were significant ($p>0.10$). The effect of surface current was not significant for rockfish CPUE ($p>0.10$), but was weakly significant for rockfish and lingcod CPUE ($p=0.08$) and was highly significant for total CPUE ($p<0.01$). In all cases CPUE was highest for surface currents of '2' on a scale of '1' (nil) to '4' (strong), and was lowest for surface currents of '3'. In the 1984 data, the effects of time of day, weather conditions and sea state were significant (Richards et al. 1985a). However, fishing in 1984 was conducted as late as November when weather conditions were poor. Weather effects were not significant for CPUE collected during August 1984, a period more comparable to the 1985 data. Surface current was not recorded in 1984.

SPECIES COMPOSITION

Dogfish Squalus acanthias, copper rockfish Sebastes caurinus, quillback rockfish S. maliger, yelloweye rockfish S. ruberrimus and lingcod Ophiodon elongatus were the dominant species in the catch (Table 2). Other species included silvergrey rockfish S. brevispinis, greenstriped rockfish S. elongatus, kelp greenling Hexagrammos decagrammus, butter sole Isopsetta isolepis, rock sole Lepidopsetta bilineata, and yellowfin sole Limanda aspera. Copper rockfish were always caught in the top 40 m of the water column, with the exception of one fish (the largest recorded) caught near 55 m at Bjerre Shoal (Site 16-242). Conversely, greenstriped rockfish were always caught at depths below 40 m. Tiger rockfish, although caught in 1984, were not present in the 1985 catch.

Chi-square tests were used to examine the effects of depth and statistical area on species composition. The effect of depth is significant (Table 3). The proportions of copper rockfish and lingcod in the catch decreased with depth, and the proportions of quillback rockfish and yelloweye rockfish increased. Because of this depth effect, the effect of statistical area was tested separately for eacn depth interval. The effect of statistical area is significant at all depth intervals (Table 4). Over 5-40 m, proportionately more copper rockfish and fewer dogfish and quillback rockfish were caught in area 15 than in area 16. Over the deeper depths, proportionately more dogfish and yelloweye rockfish, and proportionately fewer quillback rockfish were caught in area 15 than in area 16.

Species composition differed between 1984 and 1985 over 5-40 m, and over 41-70 m and 71-100 m in statistical area 15 (Table 5). In all cases, more dogfish and fewer lingcod were caught in 1985. The difference over 5-40 m may be accounted for by the reduced catch of copper rockfish from the M/V KETA in 1984, compared to the catch from smaller vessels including the CABEZON (Richards et al. 1985a).

SIZE COMPOSITION

Length-frequency histograms (data from all sites combined) are displayed in Figure 2 for copper rockfish, greenstriped rockfish, yelloweye rockfish and lingcod. We used Kruskal-Wallis tests to compare median lengths and weights for each sex of each species across depth intervals, and Wilcoxon two-sample tests to compare with sizes recorded in 1984 (Richards et al. 1985a) and in the recreational catch. The median length and weight for male and female quillback rockfish increased with depth ($p<0.01$). Hence, length-frequency histograms for quillback rockfish (Fig. 3) are displayed for each depth interval. Other depth comparisons were not significant ($p>0.10$). Mean lengths and weights (where measured) corresponding to Figures 2 and 3 are presented in Table 6.

Between 1984 and 1985, there was a decrease in the median length of male and female copper rockfish in the catch ($p<0.05$). There was a

significant decrease in size in 1985 for male quillback rockfish over 5-40 m ($p<0.01$), and for female quillback rockfish over 41-70 m and 71-100 m ($p<0.05$). Differences were not significant for yelloweye rockfish or for lingcod of either sex ($p>0.10$). These comparisons are based on 1984 bait-herring data and so differences in bait between the two years could not account for the observed decrease in size. We did tend to use slightly smaller hooks in 1985 (maximum differences: 5 mm shank length, <0.05 mm thickness). The effect of a minor change in hook size is not known, but is probably unimportant.

Length-frequency histograms for fish sampled from the recreational fishery are displayed in Figure 4. Mean lengths were 32.2±1.3 cm for male quillback rockfish (n=11), 32.7±1.4 cm for female quillback rockfish (n=13), 54.7±1.6 cm for male lingcod (n=20), and 56.9±2.3 cm for female lingcod (n=17). The median length of male and female quillback rockfish did not differ between the recreational and the research catch ($p>0.10$). However, there were significantly larger lingcod of both sexes caught in the recreational fishery ($p\leq0.01$).

Weight-length relationships for copper rockfish, greenstriped rockfish, quillback rockfish and yelloweye rockfish (data combined from all sites) are presented in Figure 5 and Table 7. There were no differences between males and females in the weight-length regressions ($p>0.10$, F-tests) and data were combined over sexes for the analysis.

TEMPERATURE AND SALINITY

Temperature and salinity profiles for the study sites are shown in Figures 5 and 6. In general, most of the change occurred within the top 20-25 m of the water column. The northern sites tended to show more stratification. As there was very little difference among profiles of a site sampled on different days, it is unlikely that changes in temperature or salinity could account for variation in CPUE among days within a site. Comparable temperature and salinity measurements were not made in 1984.

ACKNOWLEDGMENTS

Jim Selsby and Rudi van den Broek participated in all the field aspects of this program. Thanks to Mark Saunders for reviewing the manuscript.

REFERENCES

Cass, A. J., R. J. Beamish, and M. S. Smith. 1984. Study of the biology of lingcod off the west coast of Vancouver Island, M/V ARCTIC HARVESTER, November 22-December 2, 1977. Can. Data Rep. Fish. Aquat. Sci. 461: 73 p.

Folonoff, N. P. and R. C. Millard, Jr. 1983. Algorithms for computation of fundamental properties of sea water. UNESCO Tech. Paper Mar. Sci. 44: 53 p.

Nagtegaal, D. A. and S. P. Farlinger. 1980. Catches and trawl locations of M/V BLUE WATERS during rockfish exploration and assessment cruise to the west coast of the Queen Charlotte Islands, 1979. Can. Data Rep. Fish. Aquat. Sci. 215: 74 p.

Richards, L. J. and A. J. Cass. 1985. Transect counts of rockfish in the Strait of Georgia from the submersible PISCES IV, October and November 1984. Can. Data Rep. Fish. Aquat. Sci. 511: 99 p.

Richards, L. J., A. J. Cass, J. R. Selsby, R. van den Broek, and S. D. Loynachan. 1985a. A summary of research catch and effort data for nearshore reef-fishes collected during 1984 in MSA 15 and 16 of the Strait of Georgia. Can. MS Rep. Fish. Aquat. Sci. 1833: 69 p.

Richards, L. J., J. Paul, A. J. Cass, L. Fitzpatrick, R. van den Broek and C. Lauridsen. 1985b. SCUBA survey of rockfish assemblages in the Strait of Georgia, July to October 1984. Can. Data Rep. Fish. Aquat. Sci. (in press).

Westrheim, S. J. 1975. Reproduction, maturation, and identification of larvae of some Sebastes (Scorpaenidae) species in the northeast Pacific Ocean. J. Fish. Res. Board Can. 32: 2399-2411.

Table 1. A summary of CPUE data by species for each depth interval and site. Depth intervals are 5-40 m (1), 41-70 m (2), and 71-100 m (3). N, number of records for that depth and site; NF, number of fish caught; DUR, total time fishing at that depth and site; QB, quillback rockfish CPUE; YE, yelloweye rockfish CPUE; RF, combined rockfish CPUE; LC, lingcod CPUE; DF, dogfish CPUE; TOT, CPUE for combined catch.

DEP	SITE	N	NF	DUR	CPUE by Species					
				(h)	QB	YE	RF	LC	DF	TOT
1	15006	4	4	2.85	-	-	0.35	0.70	0.35	1.40
1	15027	4	17	2.50	0.40	-	4.80	1.20	0.80	6.80
1	15056	4	13	3.15	0.32	1.59	3.49	0.63	-	4.13
1	15060	4	14	2.70	0.37	-	2.22	0.37	2.59	5.19
1	15088	5	16	3.25	-	-	3.69	-	0.62	4.92
1	15103	4	36	2.75	2.18	0.73	9.82	2.91	-	13.09
1	15121	3	23	2.95	1.69	0.34	5.42	0.68	1.69	7.80
1	16073	3	15	2.15	0.47	-	1.86	1.86	2.79	6.98
1	16102	3	13	2.08	1.44	0.96	4.32	-	1.44	6.24
1	16113	5	23	3.95	-	-	0.25	0.51	4.05	5.82
1	16166	4	10	2.65	0.75	0.38	1.13	1.89	0.75	3.77
1	16168	2	11	1.30	3.85	1.54	6.92	1.54	-	8.46
1	16201	4	17	2.60	1.54	-	3.85	1.54	0.38	6.54
1	16216	3	5	2.25	0.44	0.44	1.33	0.89	-	2.22
1	16223	4	31	2.95	1.69	-	8.47	1.36	0.34	10.51
1	16234	3	18	2.30	6.09	-	6.09	1.74	-	7.83
1	16242	4	4	2.50	-	-	0.80	-	-	1.60
2	15006	3	7	1.60	2.50	1.88	4.38	-	-	4.38
2	15027	5	18	3.50	1.14	2.00	3.14	-	1.71	5.14
2	15056	5	29	3.85	2.60	3.12	5.71	-	1.82	7.53
2	15060	5	22	3.20	0.31	4.06	4.37	-	2.50	6.87
2	15103	4	10	2.65	1.13	2.26	3.77	-	-	3.77
2	15121	3	16	2.55	0.39	-	0.78	-	5.49	6.27
2	16073	4	13	2.02	3.47	0.50	3.97	-	2.48	6.45
2	16102	3	8	2.05	1.95	0.49	2.44	0.98	-	3.90
2	16113	3	12	2.58	1.55	1.16	2.71	0.39	1.55	4.65
2	16166	4	14	2.80	0.71	2.86	3.93	1.07	-	5.00
2	16168	2	4	1.30	0.77	-	1.54	0.77	0.77	3.08
2	16201	1	0	0.60	-	-	-	-	-	0.00
2	16216	3	11	2.15	1.40	2.33	5.12	-	-	5.12
2	16223	3	3	2.20	0.91	-	0.91	-	0.45	1.36
2	16234	3	6	2.05	0.49	0.49	1.46	0.49	0.49	2.93
2	16242	3	2	1.00	-	-	1.00	-	1.00	2.00

Table 1 (cont'd)

DEP	SITE	N	NF	DUR (h)	CPUE by Species					
					QB	YE	RF	LC	DF	TOT
3	15006	3	2	1.65	-	0.61	0.61	-	0.61	1.21
3	15027	2	5	1.20	1.67	-	1.67	-	2.50	4.17
3	15056	2	12	1.55	1.94	3.23	5.81	-	1.94	7.74
3	15060	5	16	2.95	1.02	2.03	3.39	-	2.03	5.42
3	15103	3	14	1.30	0.77	3.08	4.62	-	6.15	10.77
3	15121	1	1	0.90	-	-	-	-	1.11	1.11
3	16073	4	38	3.20	6.56	2.81	9.69	-	2.19	11.87
3	16102	1	3	0.55	1.82	1.82	3.64	1.82	-	5.45
3	16166	5	20	3.55	1.97	2.25	4.51	-	1.13	5.63
3	16168	1	2	0.60	1.67	-	3.33	-	-	3.33
3	16216	3	16	1.95	4.10	3.59	7.69	0.51	-	8.21
3	16223	3	9	2.30	1.74	0.43	3.48	-	0.43	3.91
3	16234	3	13	2.10	4.29	-	5.71	-	0.48	6.19
3	16242	2	2	1.60	0.63	-	0.63	-	0.63	1.25

Table 2. Species composition (%) of the catch, summarized by depth interval and site. Depth intervals are 5-40 m (1), 41-70 m (2), and 71-100 m (3). N, number of records; DF dogfish, Squalus acanthias; SG silvergrey rockfish, Sebastes brevispinis; CO copper rockfish, S. caurinus; GS greenstriped rockfish, S. elongatus; QB quillback rockfish, S. maliger; YE yelloweye rockfish, S. ruberrimus; KG kelp greenling, Hexagrammos decagrammus; LC lingcod, Ophiodon elongatus; BS butter sole, Isopsetta isolepis; RS rock sole, Lepidopsetta bilineata; YS yellowfin sole, Limanda aspera; NF number of fish.

DEP	SITE	N	Species composition (%)										NF
			DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS	
1	15006	4	0.250	-	0.250	-	-	-	-	0.500	-	-	-	4
1	15027	4	0.118	-	0.647	-	0.059	-	-	0.176	-	-	-	17
1	15056	4	-	-	0.385	-	0.077	0.385	-	0.154	-	-	-	13
1	15060	4	0.500	-	0.357	-	0.071	-	-	0.071	-	-	-	14
1	15088	5	0.125	-	0.750	-	-	-	-	-	-	-	0.125	16
1	15103	4	-	-	0.528	-	0.167	0.056	0.028	0.222	-	-	-	36
1	15121	3	0.217	-	0.435	-	0.217	0.043	-	0.087	-	-	-	23
1	16073	3	0.400	-	0.200	-	0.067	-	-	0.267	0.067	-	-	15
1	16102	3	0.231	-	0.308	-	0.231	0.154	0.077	-	-	-	-	13
1	16113	5	0.696	-	0.043	-	-	-	0.130	0.087	-	0.043	-	23
1	16166	4	0.200	-	-	-	0.200	0.100	-	0.500	-	-	-	10
1	16168	2	-	-	0.182	-	0.455	0.182	-	0.182	-	-	-	11
1	16201	4	0.059	-	0.353	-	0.235	-	0.118	0.235	-	-	-	17
1	16216	3	-	-	0.200	-	0.200	0.200	-	0.400	-	-	-	5
1	16223	4	0.032	-	0.645	-	0.161	-	-	0.129	-	0.032	-	31
1	16234	3	-	-	-	-	0.778	-	-	0.222	-	-	-	18
1	16242	4	-	-	0.500	-	-	-	-	-	0.250	0.250	-	4
2	15006	3	-	-	-	-	0.571	0.429	-	-	-	-	-	7
2	15027	5	0.333	-	-	-	0.222	0.389	0.056	-	-	-	-	18
2	15056	5	0.241	-	-	-	0.345	0.414	-	-	-	-	-	29
2	15060	5	0.364	-	-	-	0.045	0.591	-	-	-	-	-	22
2	15103	4	-	-	-	0.100	0.300	0.600	-	-	-	-	-	10
2	15121	3	0.875	-	-	0.063	0.063	-	-	-	-	-	-	16
2	16073	4	0.385	-	-	-	0.538	0.077	-	-	-	-	-	13
2	16102	3	-	-	-	-	0.500	0.125	0.125	0.250	-	-	-	8
2	16113	3	0.333	-	-	-	0.333	0.250	-	0.083	-	-	-	12
2	16166	4	-	-	-	0.071	0.143	0.571	-	0.214	-	-	-	14
2	16168	2	0.250	0.250	-	-	0.250	-	-	0.250	-	-	-	4
2	16216	3	-	-	-	0.273	0.273	0.455	-	-	-	-	-	11
2	16223	3	0.333	-	-	-	0.667	-	-	-	-	-	-	3
2	16234	3	0.167	-	-	0.167	0.167	0.167	-	0.167	0.167	-	-	6
2	16242	3	0.500	-	0.500	-	-	-	-	-	-	-	-	2

Table 2 (cont'd)

DEP	SITE	N	Species composition (%)										NF
			DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS	
3	15006	3	0.500	-	-	-	-	0.500	-	-	-	-	-	2
3	15027	2	0.600	-	-	-	0.400	-	-	-	-	-	-	5
3	15056	2	0.250	-	-	0.083	0.250	0.417	-	-	-	-	-	12
3	15060	5	0.375	-	-	0.063	0.188	0.375	-	-	-	-	-	16
3	15103	3	0.571	-	-	0.071	0.071	0.286	-	-	-	-	-	14
3	15121	1	1.000	-	-	-	-	-	-	-	-	-	-	1
3	16073	4	0.184	-	-	0.026	0.553	0.237	-	-	-	-	-	38
3	16102	1	-	-	-	-	0.333	0.333	-	0.333	-	-	-	3
3	16166	5	0.200	0.050	-	-	0.350	0.400	-	-	-	-	-	20
3	16168	1	-	-	-	0.500	0.500	-	-	-	-	-	-	2
3	16216	3	-	-	-	-	0.500	0.438	-	0.063	-	-	-	16
3	16223	3	0.111	-	-	0.333	0.444	0.111	-	-	-	-	-	9
3	16234	3	0.077	-	-	0.231	0.692	-	-	-	-	-	-	13
3	16242	2	0.500	-	-	-	0.500	-	-	-	-	-	-	2

Table 3. The effect of depth on species composition. Species with an expected frequency of less than 3 are excluded from the analysis. (DF dogfish, CO copper rockfish, GS greenstriped rockfish, QB quillback rockfish, YE yelloweye rockfish, LC lingcod).

Depth	Species composition (%)						N
	DF	CO	GS	QB	YE	LC	
5-40 m	18.0	39.8	-	19.1	5.5	17.6	256
41-70 m	28.1	0.6	4.1	27.5	35.1	4.6	171
71-100 m	23.7	-	7.3	40.1	27.6	1.3	152
N	130	103	18	157	116	55	579
			$\chi^2=245.94$, df=10, $p<0.001$				

Table 4. The effect of statistical area on species composition by depth. Species with an expected frequency of less than 5 are excluded from the analysis. (DF dogfish, CO copper rockfish, QB quillback rockfish, YE yelloweye rockfish, LC lingcod).

A) depth 5-40 m

Area	Species composition (%)					N
	DF	CO	QB	YE	LC	
15	14.2	52.5	11.6	6.7	15.0	120
16	21.3	28.7	25.7	4.4	19.9	136
N	46	102	49	14	45	256

χ^2=18.94, df=4, p<0.001

B) depth 41-70 m

Area	Species composition (%)			N
	DF	QB	YE	
15	35.4	23.2	41.4	99
16	23.2	42.9	33.9	56
N	48	47	60	155

χ^2=6.76, df=2, p<0.05

C) depth 71-100 m

Area	Species composition (%)			N
	DF	QB	YE	
15	46.8	19.2	34.0	47
16	15.2	56.5	28.3	92
N	36	61	42	139

χ^2=22.23, df=2, p<0.001

Table 5. A comparison of 1984 catch data with 1985 data by statistical area and depth. 1984 data are from Richards et al. (1985a) and only include catches using bait herring. Species with an expected frequency of less than 3 are excluded from the analysis. (DF dogfish, CO copper rockfish, GS greenstriped rockfish, QB quillback rockfish, YE yelloweye rockfish, LC lingcod).

A) depth 5-40 m, area 15

Year	Species composition (%)					N
	DF	CO	QB	YE	LC	
1984	13.7	25.5	29.4	9.8	21.6	51
1985	14.2	52.5	11.7	6.6	15.0	120
N	24	76	29	13	29	171

χ^2=13.9, df=4, p<0.01

B) depth 5-40 m, area 16

Year	Species composition (%)					N
	DF	CO	QB	YE	LC	
1984	7.7	37.1	14.7	2.8	37.7	143
1985	21.3	28.7	25.7	4.4	19.9	136
N	40	92	56	10	81	279

χ^2=22.97, df=4, p<0.01

C) depth 41-70 m, area 15

Year	Species composition (%)			N
	DF	QB	YE	
1984	9.8	58.5	31.7	41
1985	35.4	23.2	41.4	99
N	39	47	54	140

χ^2=18.29, df=2, p<0.01

D) depth 41-70 m, area 16

Year	Species composition (%)			N
	DF	QB	YE	
1984	16.1	51.6	32.3	36
1985	23.2	42.9	33.9	57
N	18	40	29	8

χ^2=0.83, df=2, p>0.10

E) depth 71-100 m, area 15

Year	Species composition (%)			N
	DF	QB	YE	
1984	18.5	18.5	63.0	27
1985	46.8	19.1	34.1	47
N	27	14	33	74

χ^2=6.98, df=2, p<0.05

F) depth 71-100 m, area 16

Year	Species composition (%)			N
	DF	QB	YE	
1984	9.7	54.8	35.5	31
1985	15.2	56.5	28.3	92
N	17	69	37	123

χ^2=0.93, df=2, p>0.10

Table 6. Mean lengths and weights and standard errors for each sex of each species. Data for quillback rockfish are given by depth. Data for other species are combined over all depths. Weight measurements were not taken for lingcod.

Species	Depth	Males					Females				
		n	length (mm)	S.E.	weight (g)	S.E.	n	length (mm)	S.E.	weight (g)	S.E.
Copper	-	57	255	5	292	16	43	269	8	363	39
Greenstriped	-	4	261	25	301	84	14	257	8	264	27
Quillback	5-40m	22	285	12	451	52	23	294	10	484	40
Quillback	41-70m	30	332	8	664	43	16	314	16	593	80
Quillback	71-100m	32	344	5	741	24	26	335	11	732	52
Yelloweye	-	68	375	10	1010	86	44	374	10	949	70
Lingcod	-	34	451	10			19	498	15		

Table 7. Parameters of the weight-length (g-cm) relationship ($W=aL^b$) by species, including r^2 and root mean square error. Parameters were calculated from the linear regression $\ln(W)=\ln(a) + b\ln(L)$.

Species	N	a	b	r^2	M.S.E.
Copper rockfish	100	0.0590	2.6152	0.926	0.1180
Greenstriped rockfish	18	0.0206	2.9027	0.904	0.1287
Quillback rockfish	150	0.0308	2.8420	0.959	0.1050
Yelloweye rockfish	113	0.0261	2.8775	0.977	0.0916

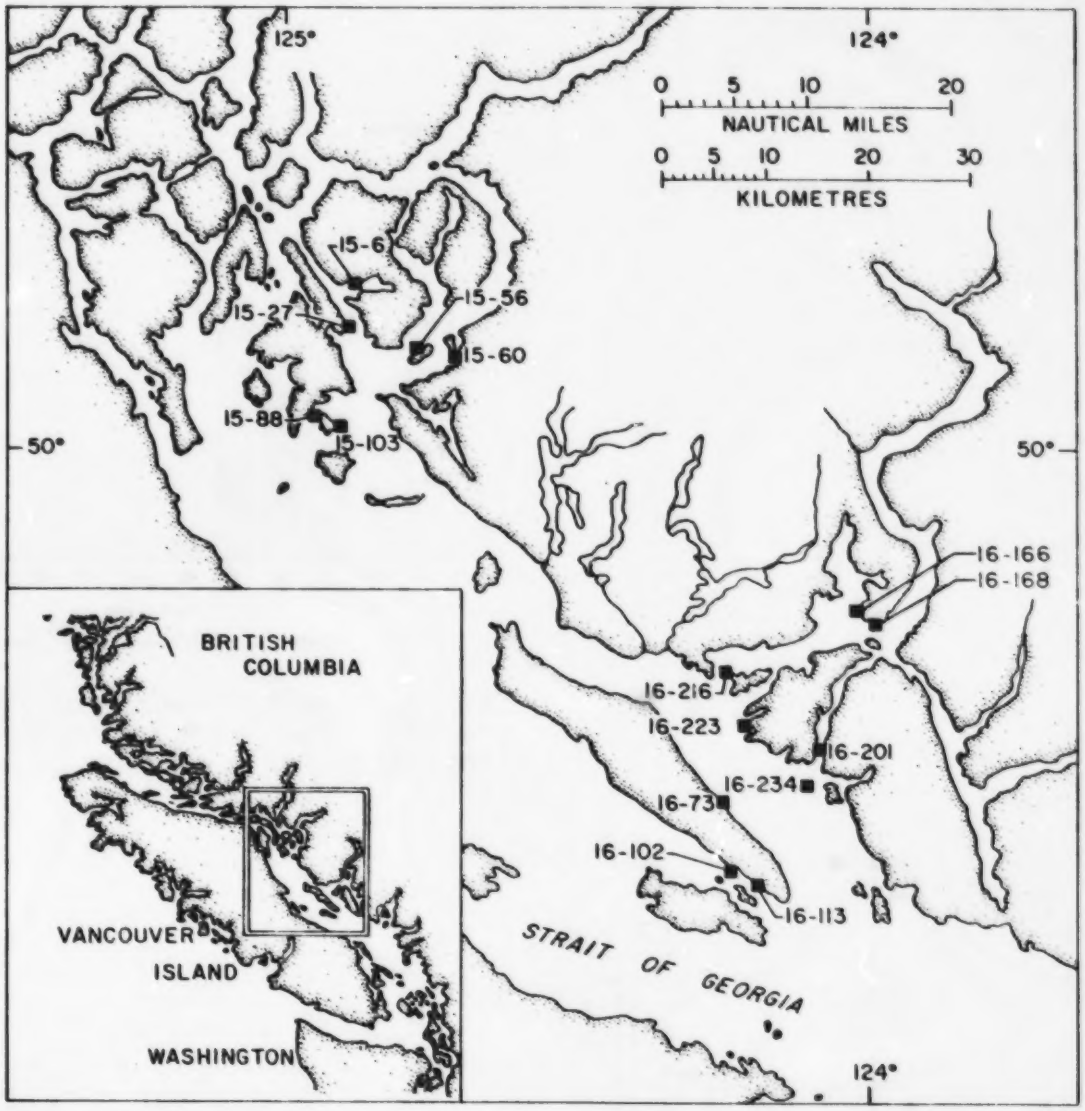


Fig. 1. Locations of study sites.

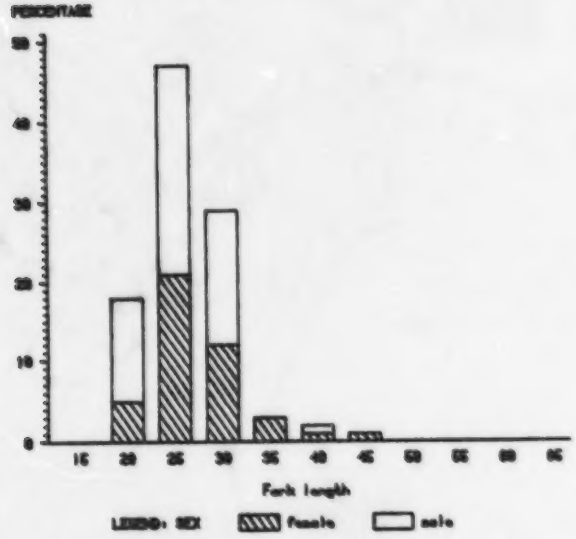


Fig. 2a. Length-frequency distribution of copper rockfish. Fork length (cm) is the midpoint of the size interval.

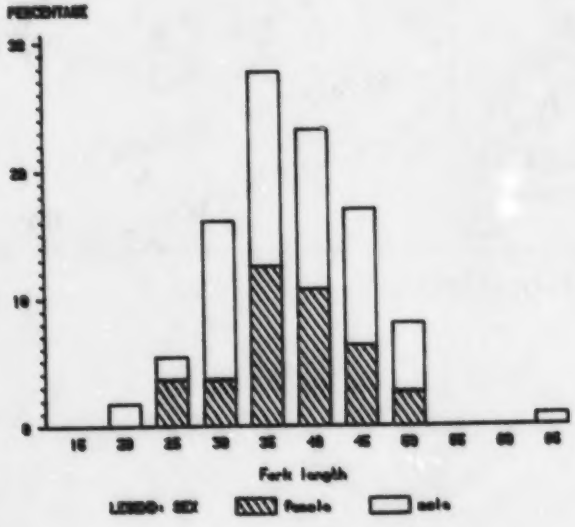


Fig. 2b. Length-frequency distribution for yelloweye rockfish. Fork length (cm) is the midpoint of the size interval.

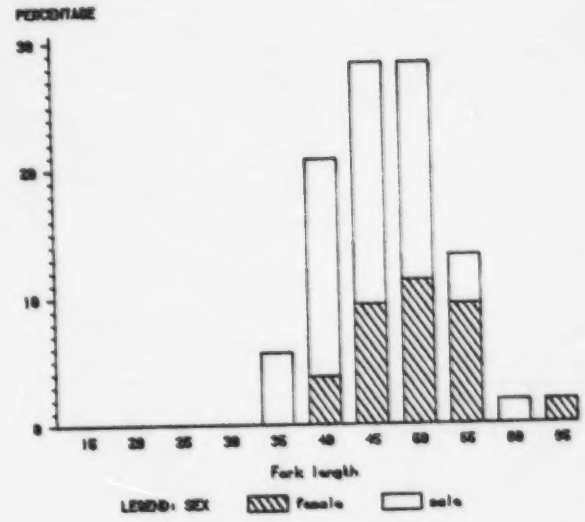


Fig. 2c. Length-frequency distribution for lingcod. Fork length (cm) is the midpoint of the size interval.

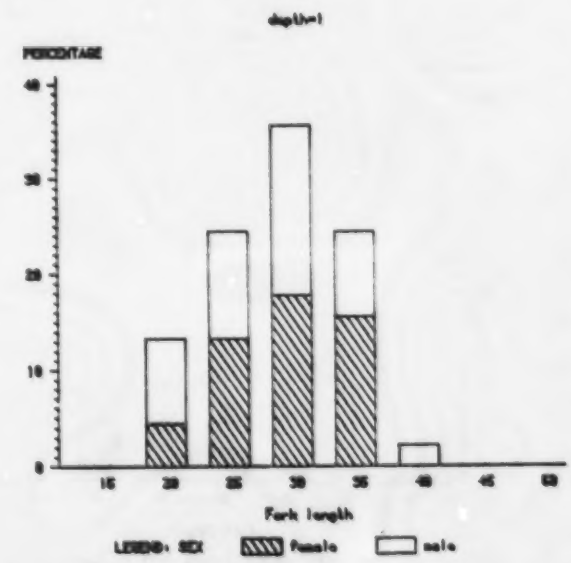


Fig. 3. Length-frequency distribution for quillback rockfish. Fork length (cm) is the midpoint of the size interval. Depths are 5-40 m (1), 41-70 m (2), 71-100 m (3).

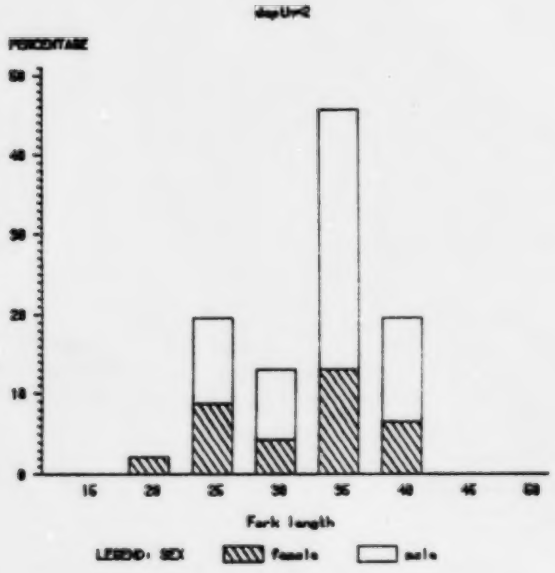
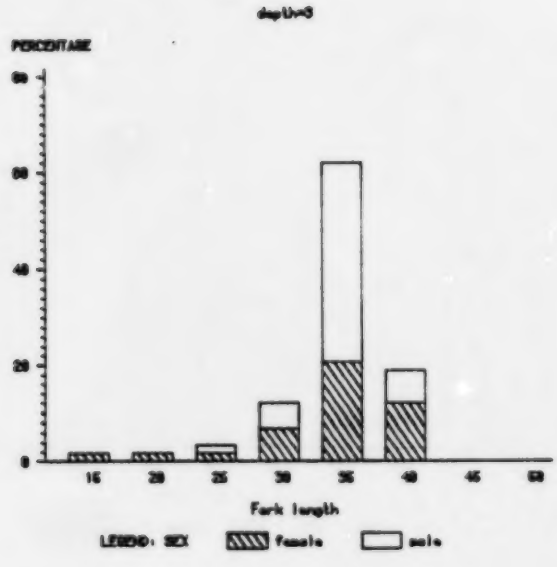

PERCENTAGE
Fork length
female
male

Fig. 3 (cont'd)


PERCENTAGE
Fork length
female
male

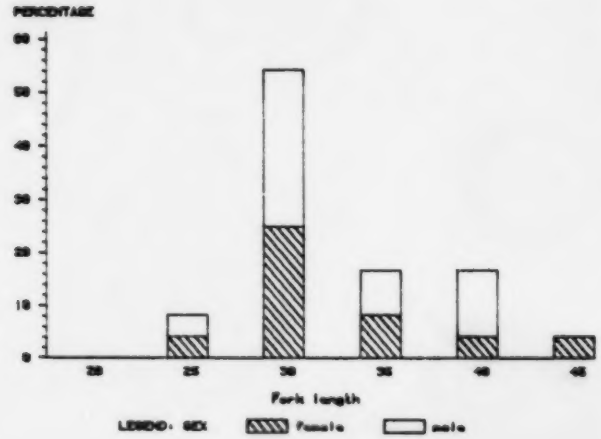


Fig. 4a. Length-frequency distribution for quillback rockfish caught in the recreational fishery. Fork length (cm) is the midpoint of the size interval.

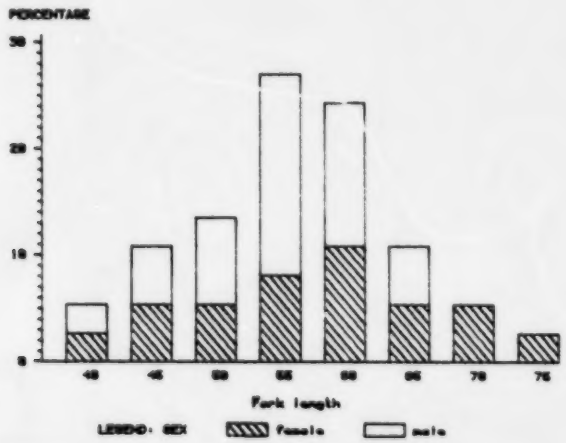


Fig. 4b. Length-frequency distribution for lingcod caught in the recreational fishery. Fork length (cm) is the midpoint of the size interval.

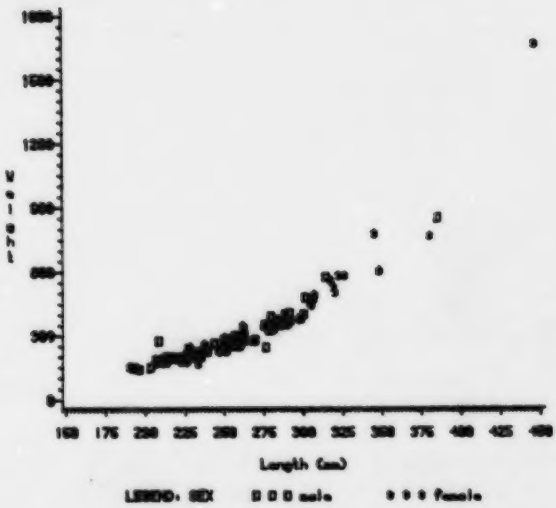


Fig. 5a. The relationship between weight (g) and fork length (mm) for copper rockfish.

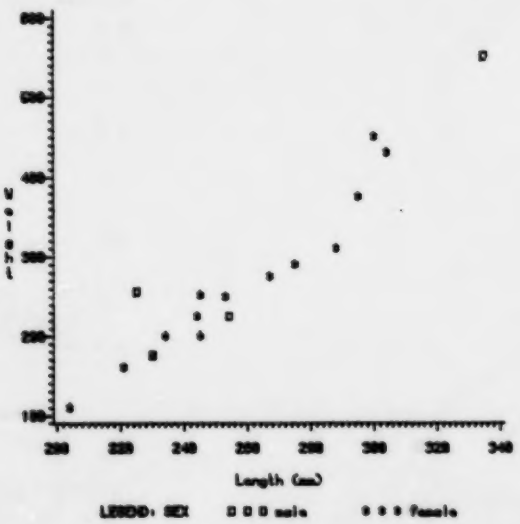


Fig. 5b. The relationship between weight (g) and fork length (mm) for greenstriped rockfish.

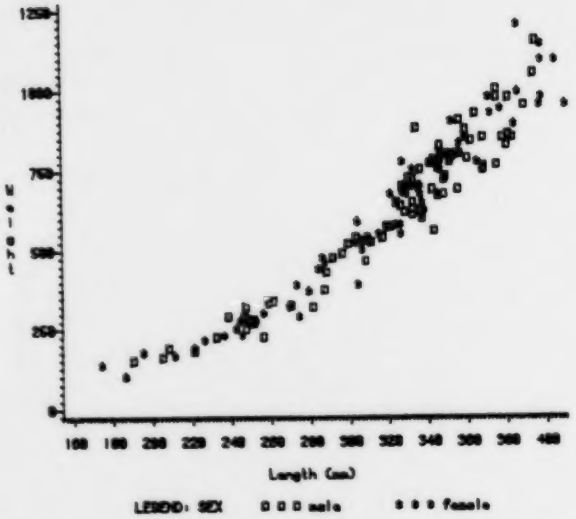


Fig. 5c. The relationship between weight (g) and fork length (mm) for quillback rockfish.

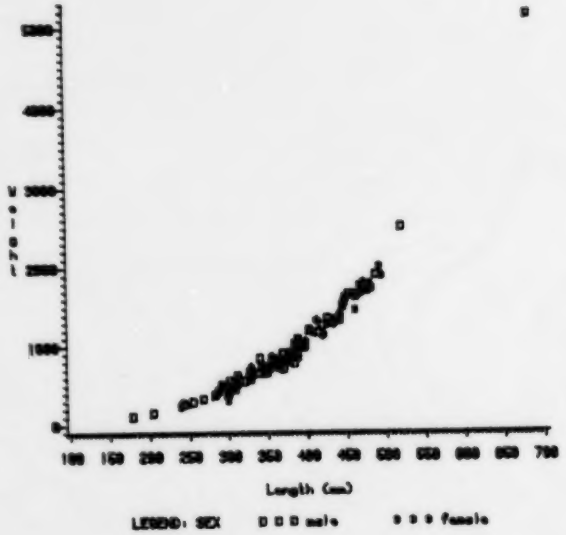
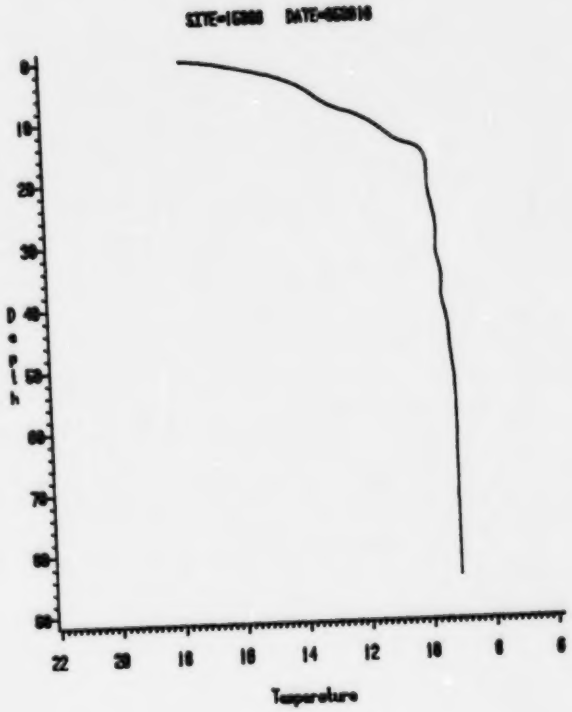


Fig. 5d. The relationship between weight (g) and fork length (mm) for yelloweye rockfish.

Fig. 6. Temperature (°C) profiles for the study sites.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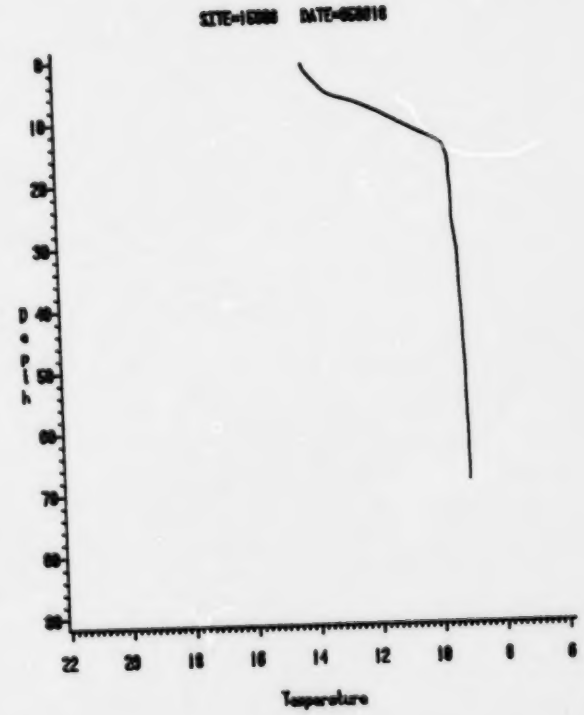
90
22
20
18
16
14
12
10
8
6
Temperature

a.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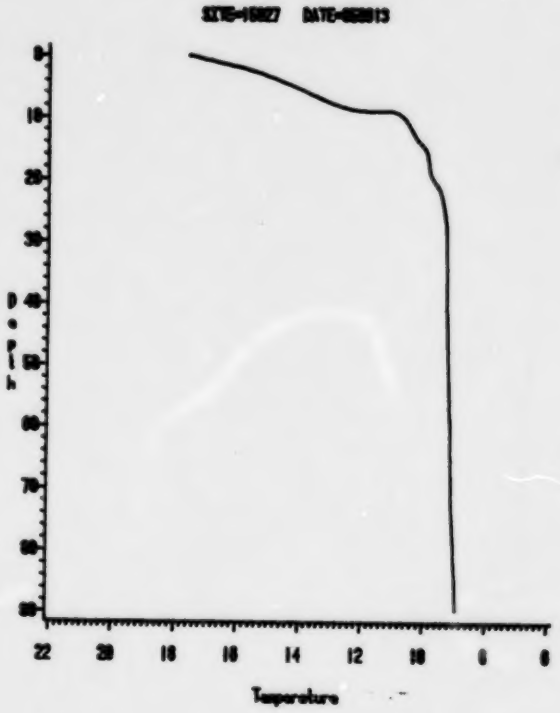
Temperature

b.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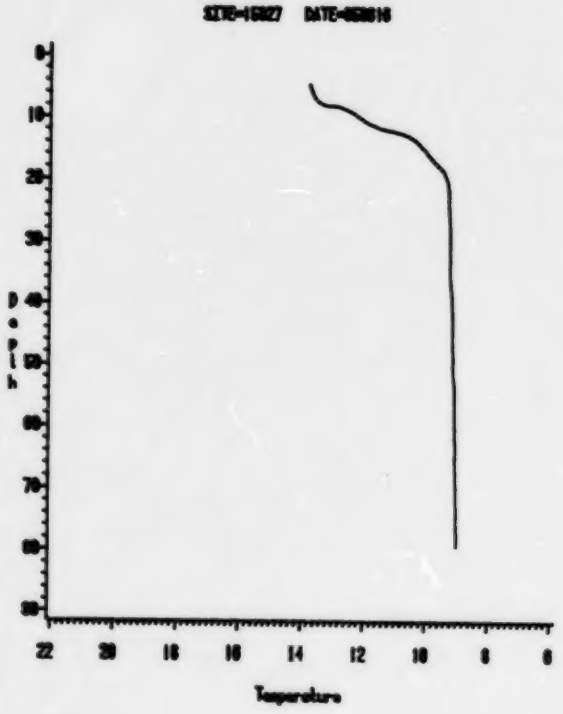
Temperature

c.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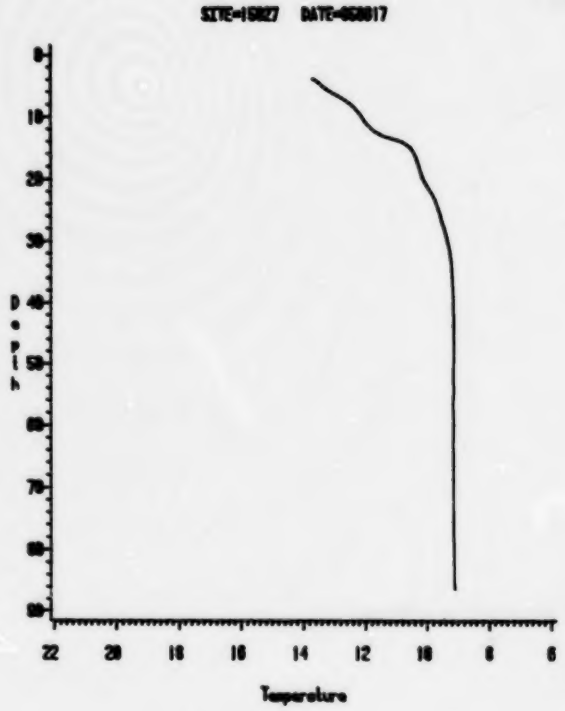
Temperature

d.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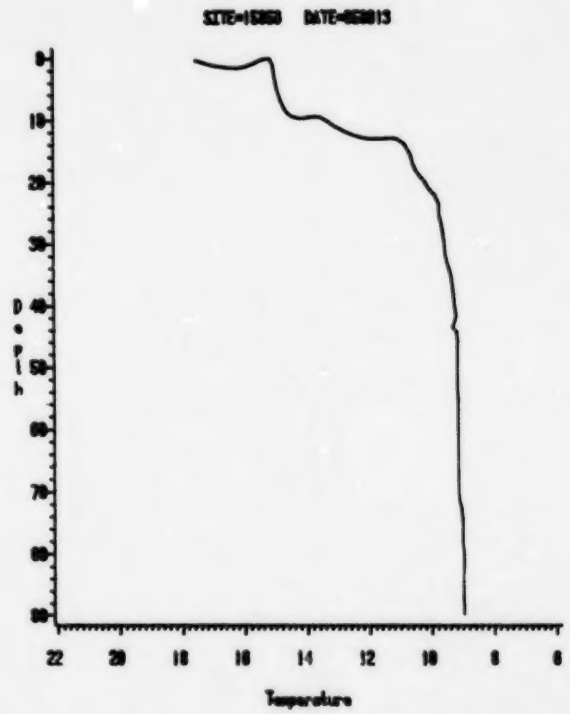
6
Temperature

e.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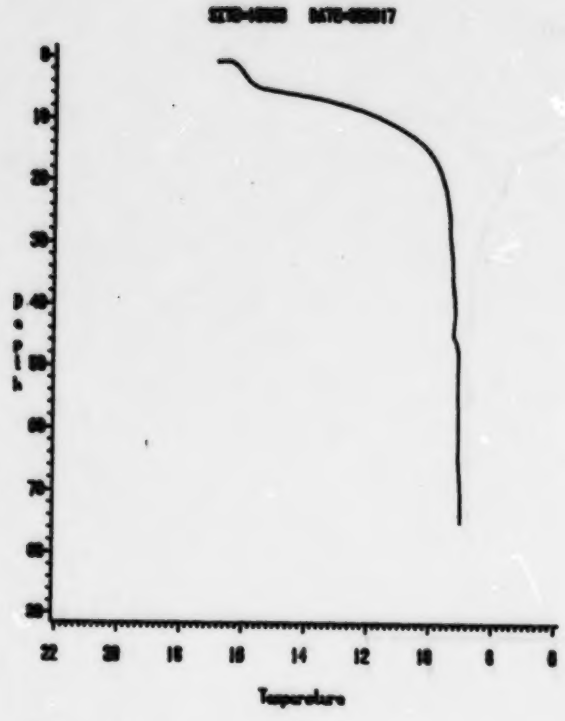
6
Temperature

f.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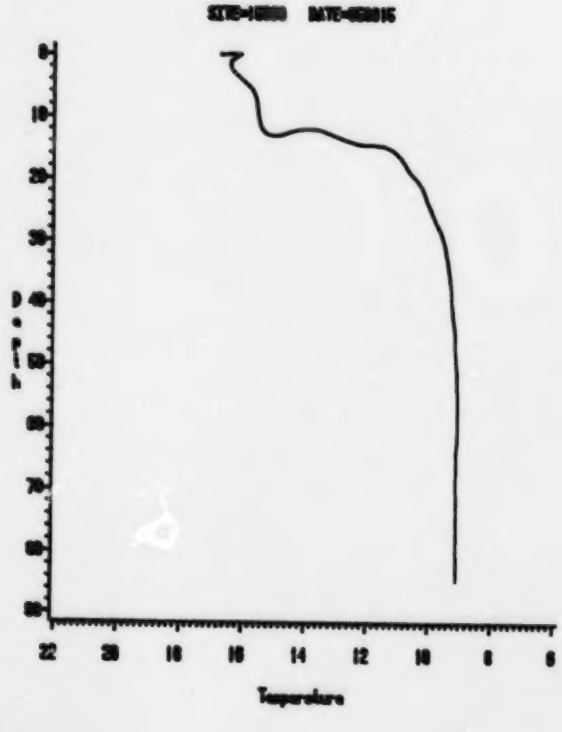
8
6
Temperature

g.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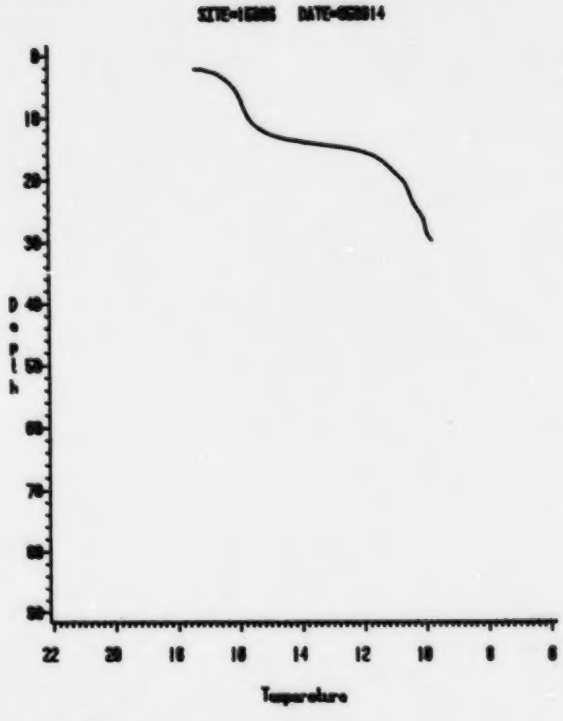
Temperature

h.



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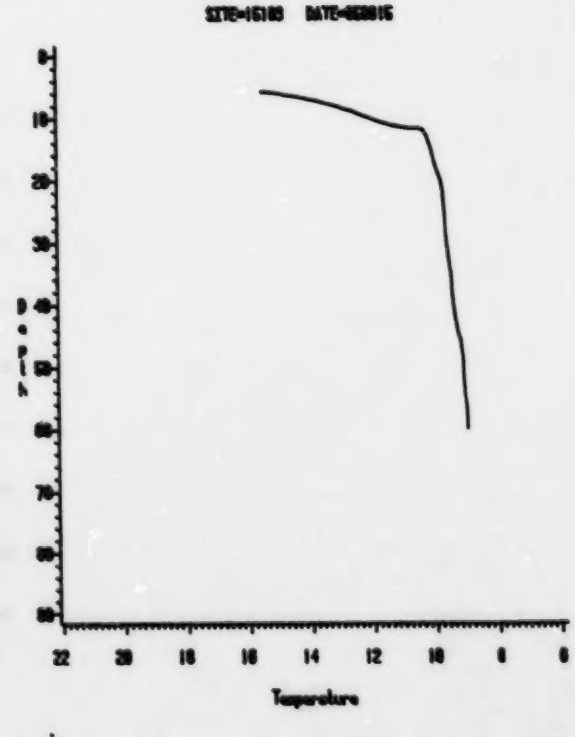

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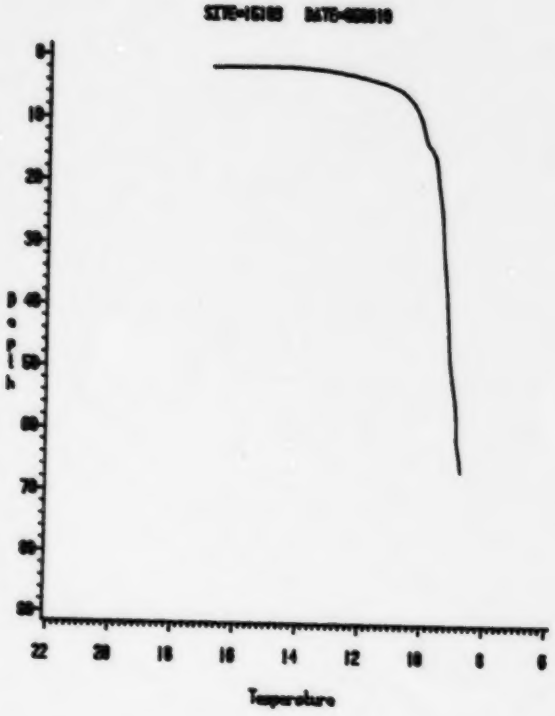

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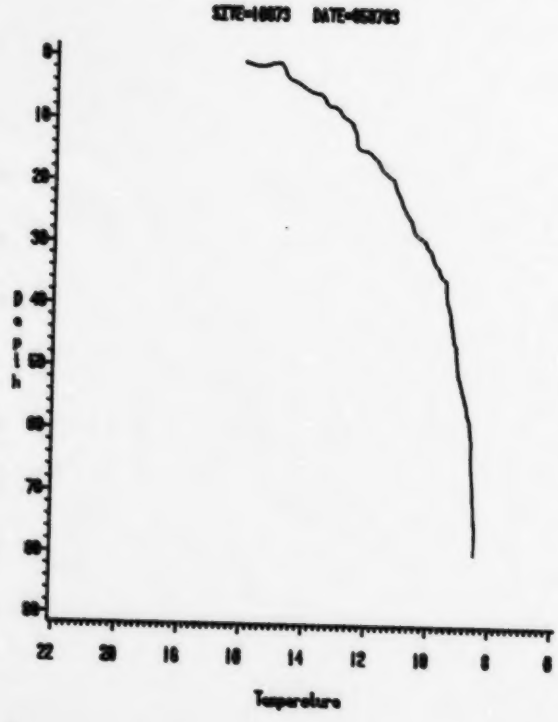

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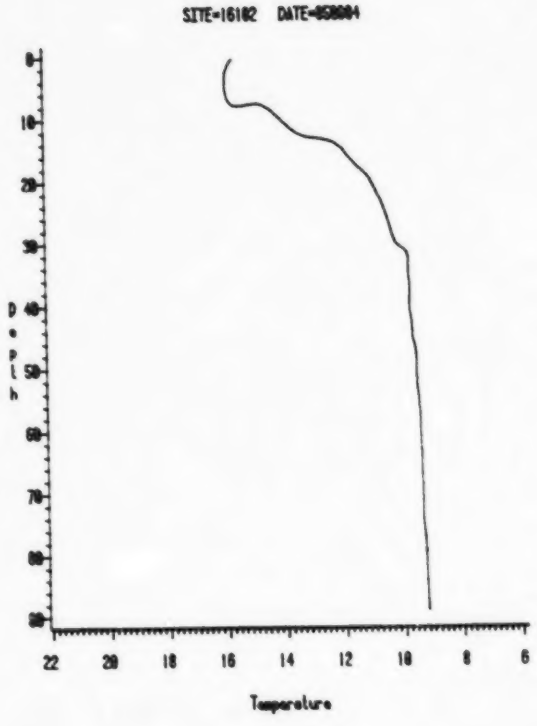
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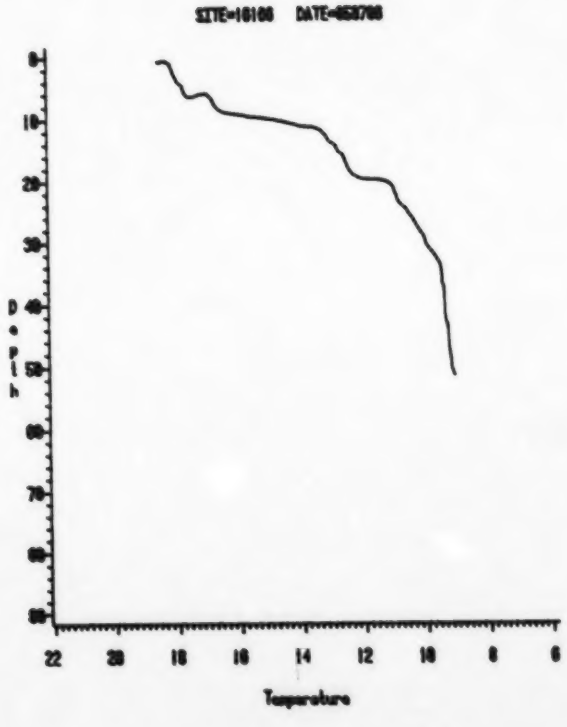
Temperature

m.


SITE=16108 DATE=
Depth
0
10
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70
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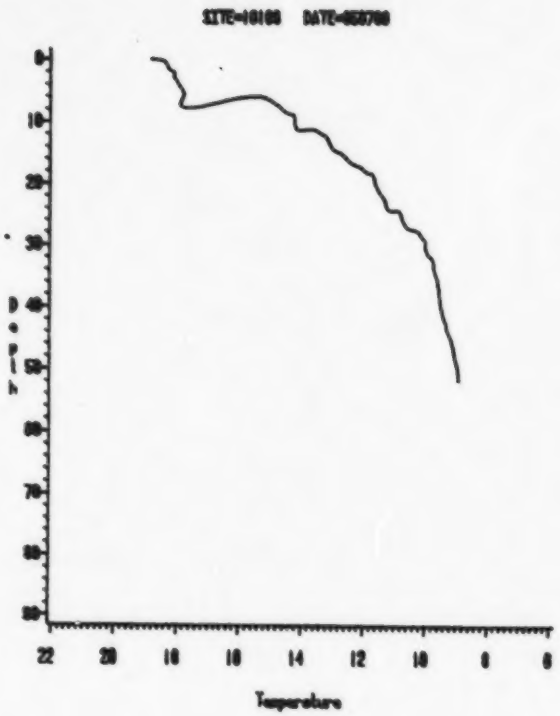
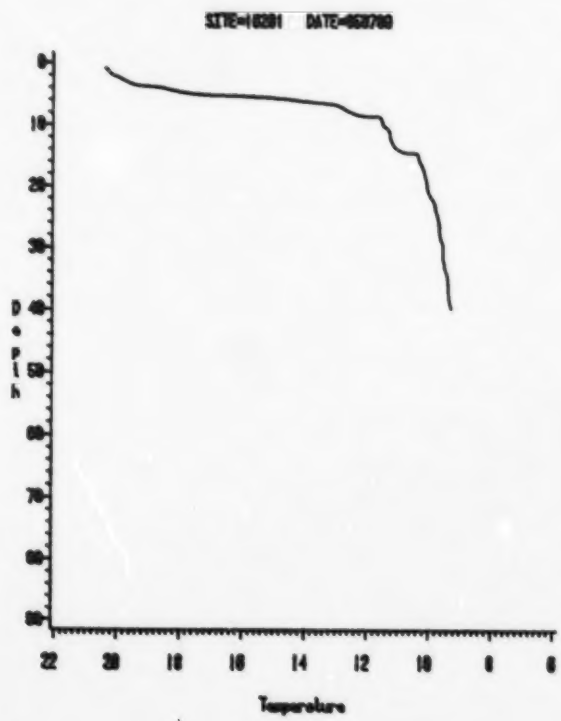
22
20
18
16
14
12
10
8
6
Temperature

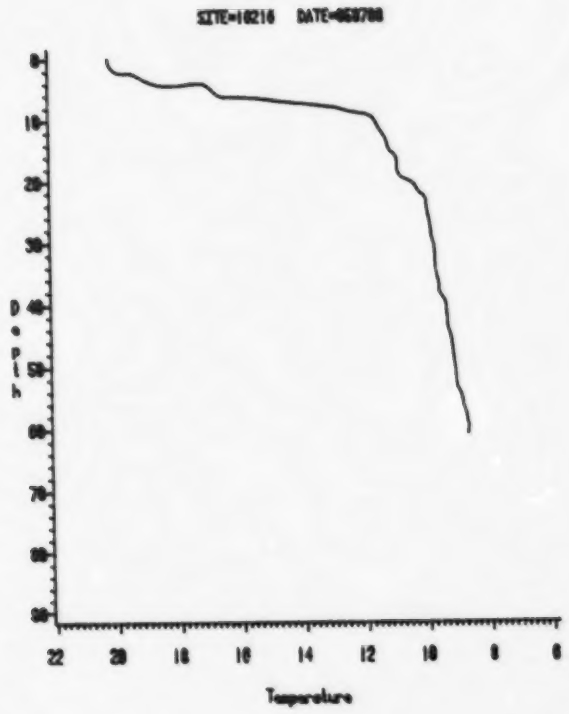
n.



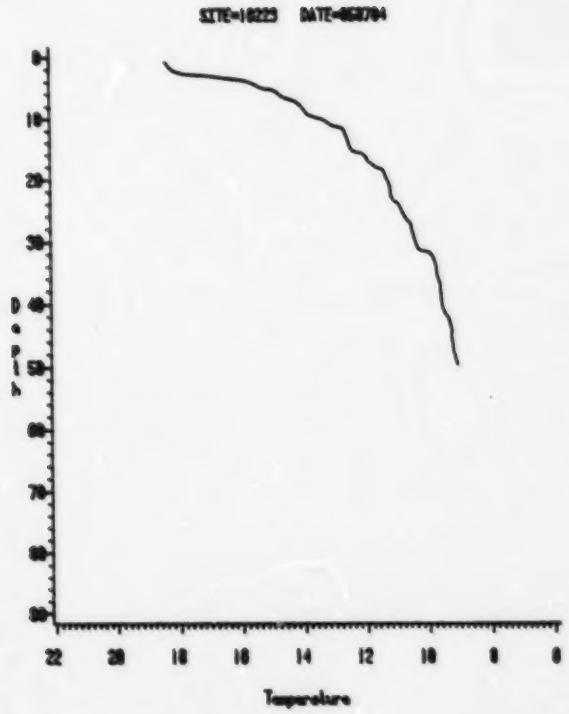
o.



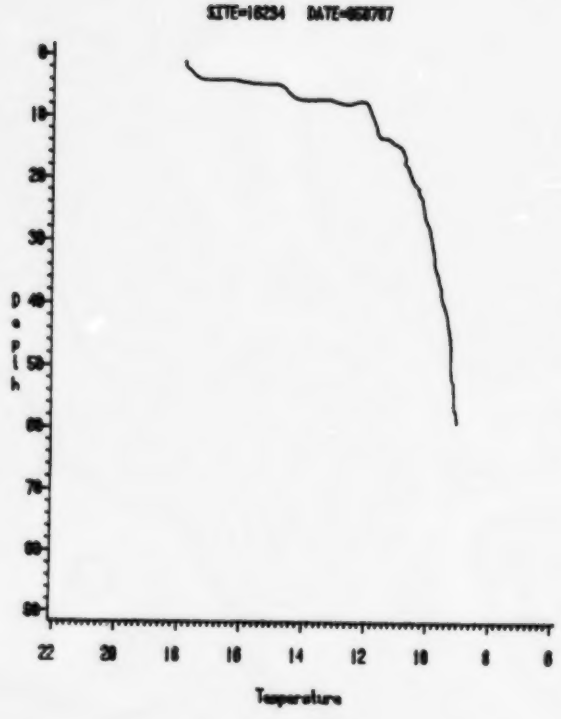
p.



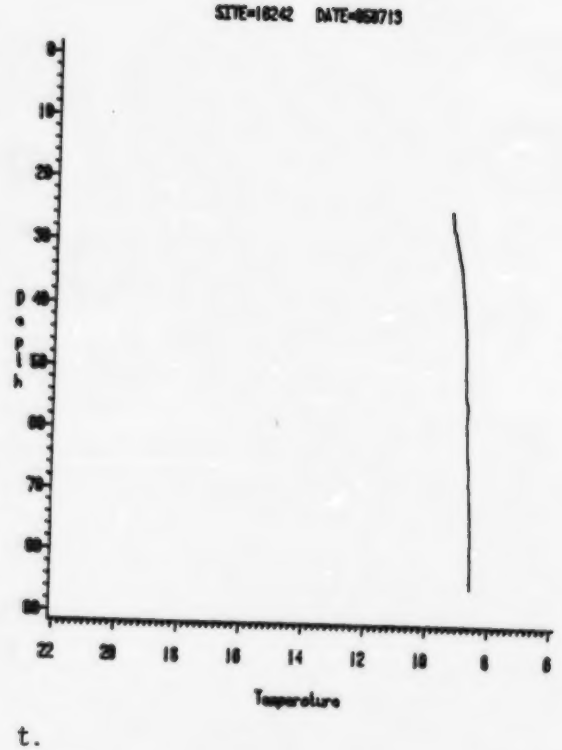
q.



r.


SITE=18234 DATE=850707
Depth
Temperature

s.


SITE=18242 DATE=850713
Depth
Temperature

t.

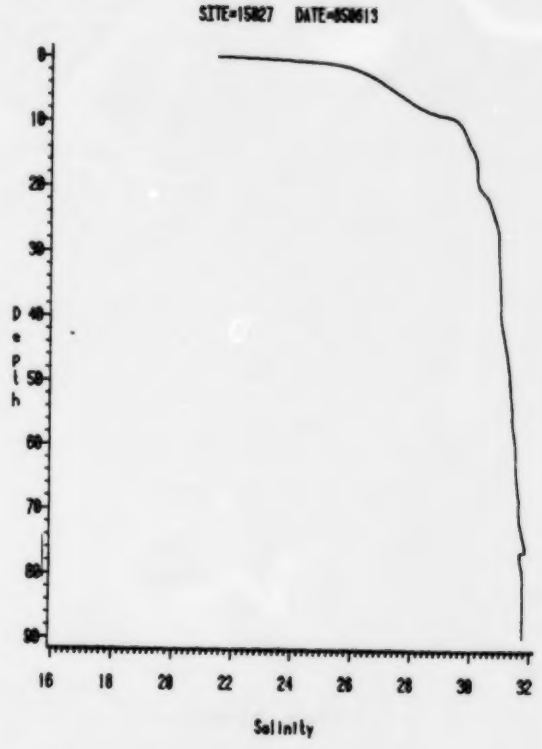
Fig. 7. Salinity (‰) profiles for the study sites.

SITE=IS006 DATE=850618
Depth
0
10
20
30
40
50
60
70
80
90
16 18 20 22 24 26 28 30 32
Salinity

a.

SITE=IS006 DATE=850618
Depth
0
10
20
30
40
50
60
70
80
90
16 18 20 22 24 26 28 30 32
Salinity

b.


SITE=15827 DATE=850613
Depth
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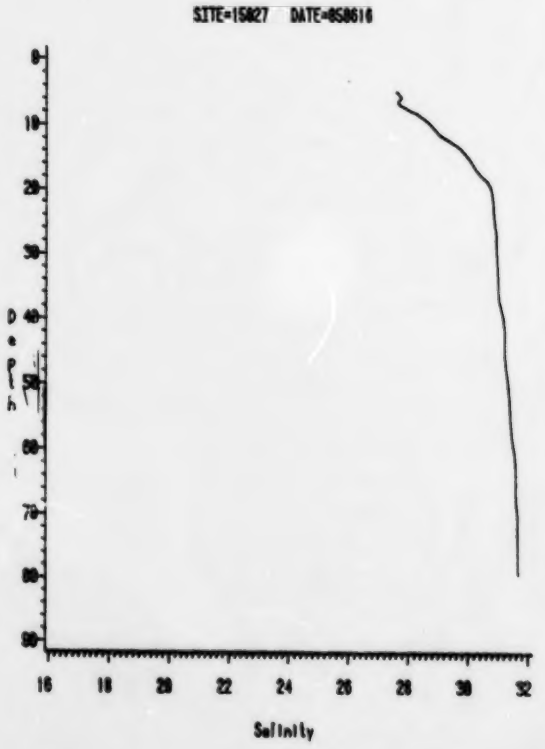
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

c.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Depth
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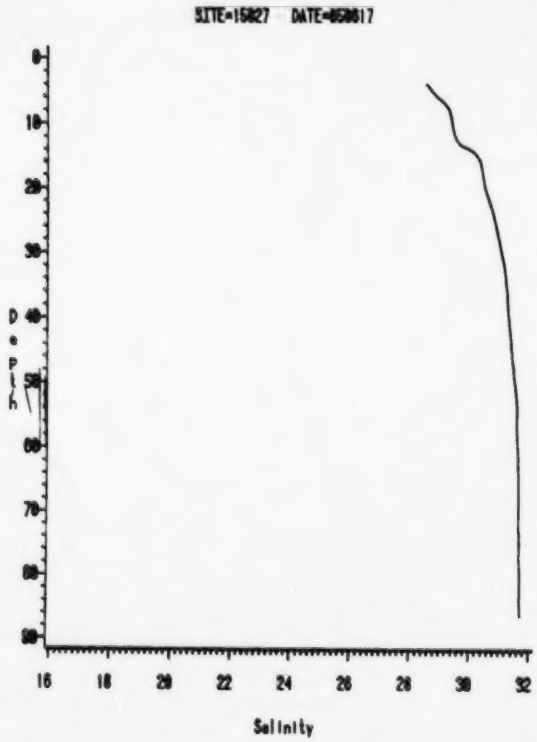
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

d.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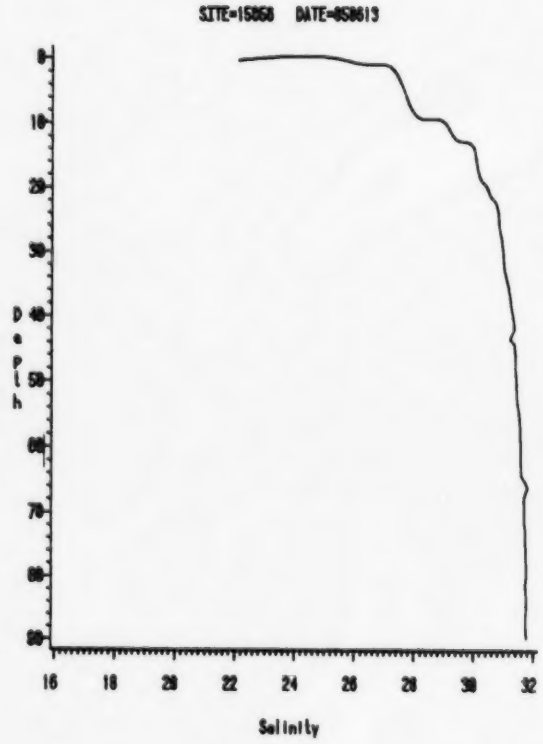
22
24
26
28
30
32
Salinity

e.


SITE=15050 DATE=850613
Depth
0
10
20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

f.

SITE=15058 DATE=850817
Depth
0
10
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30
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50
60
70
80
90
16
18
20
22
24
26
28
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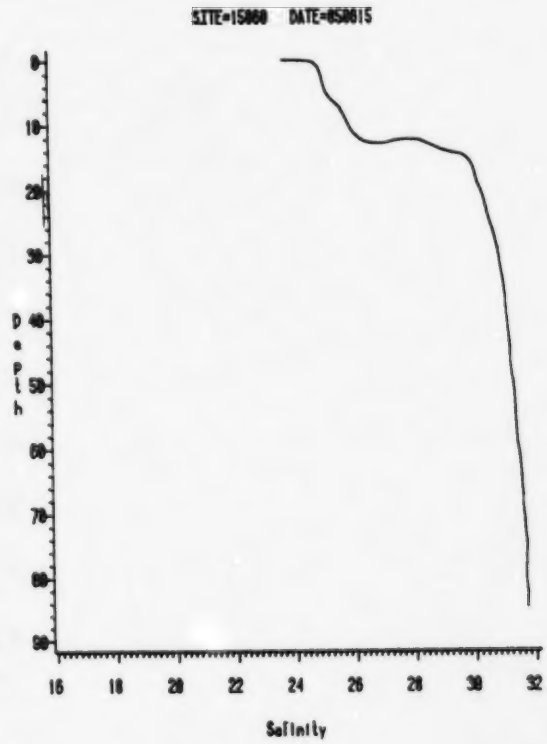
32
Salinity

g.


SITE=15060 DATE=850815
Depth
0
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20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

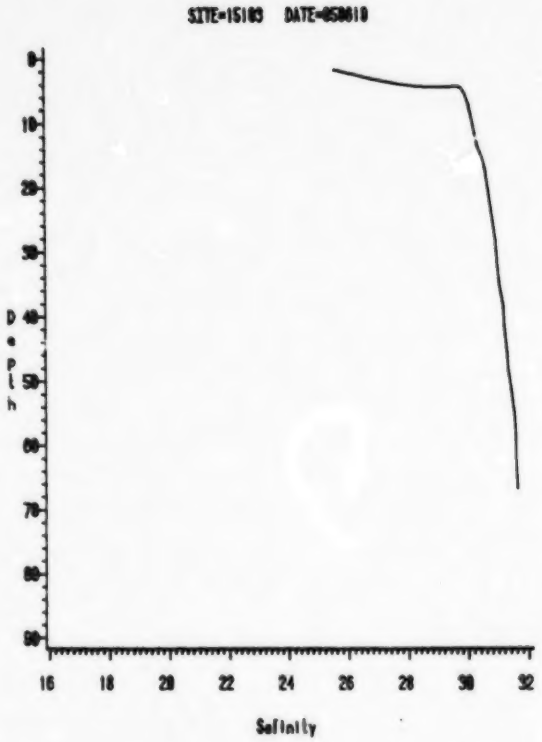
h.

SITE=15008 DATE=850814
Depth
0
10
20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

i.

SITE=15109 DATE=850815
Depth
0
10
20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

j.


SITE=15103 DATE=850810
Depth
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30
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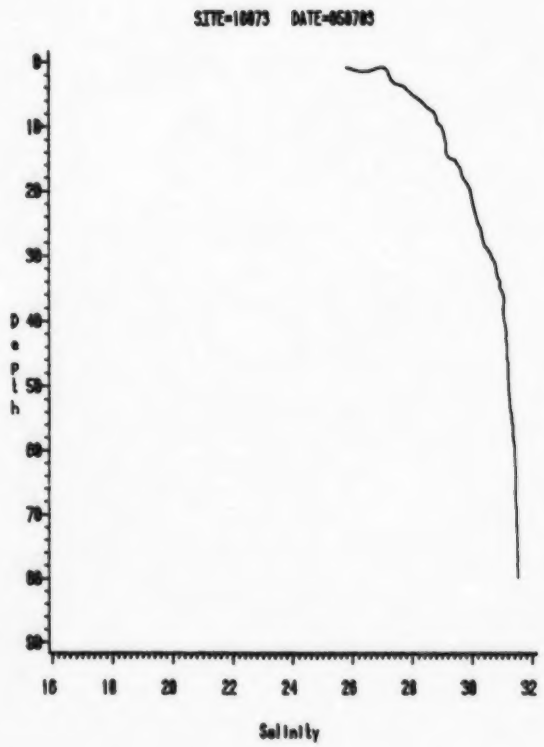
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

k.


SITE=10073 DATE=850705
Depth
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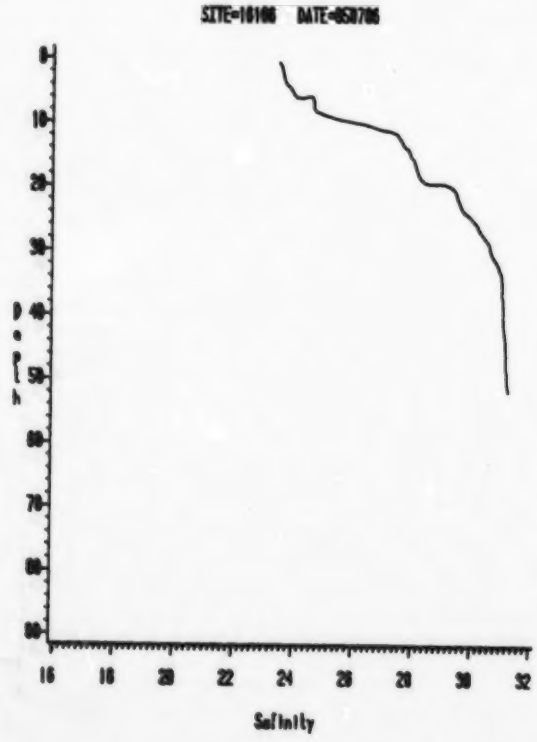
20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

l.

SITE=16102 DATE=
Depth
0
10
20
30
40
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

m.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Depth
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70
80
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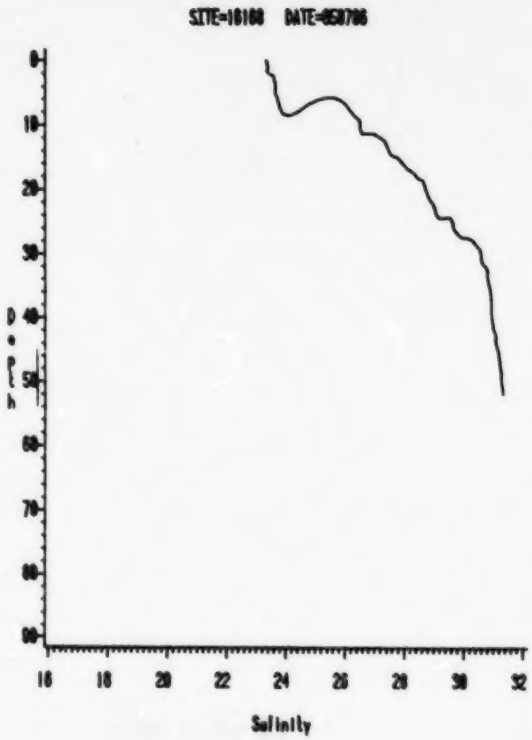
16
18
20
22
24
26
28
30
32
Salinity

n.


SITE=16188 DATE=850706
Depth
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80
90
16
18
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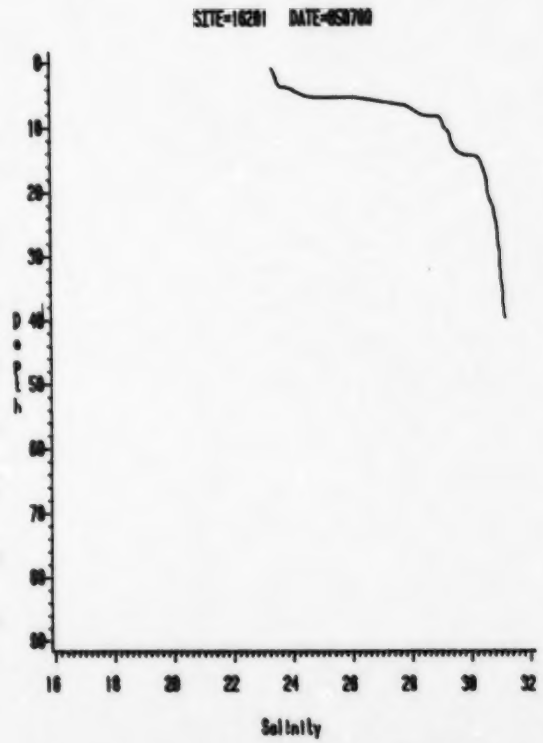
22
24
26
28
30
32
Salinity

o.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Depth
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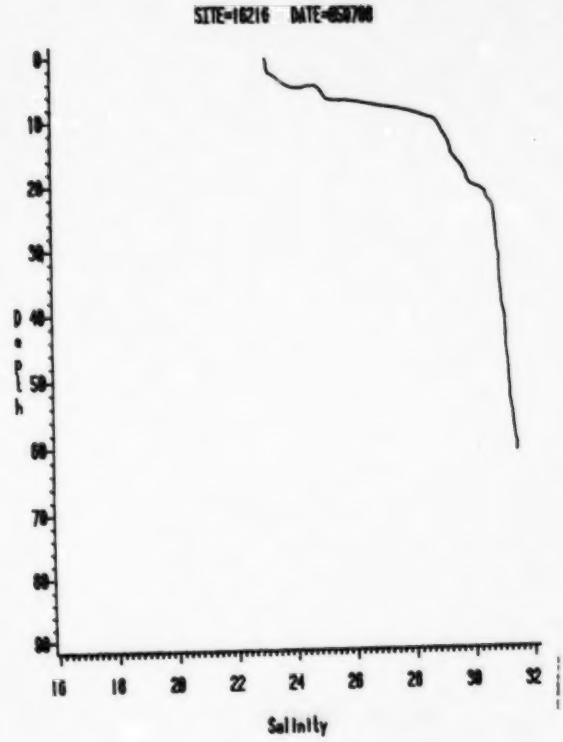
90
16
18
20
22
24
26
28
30
32
Salinity

p.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Depth
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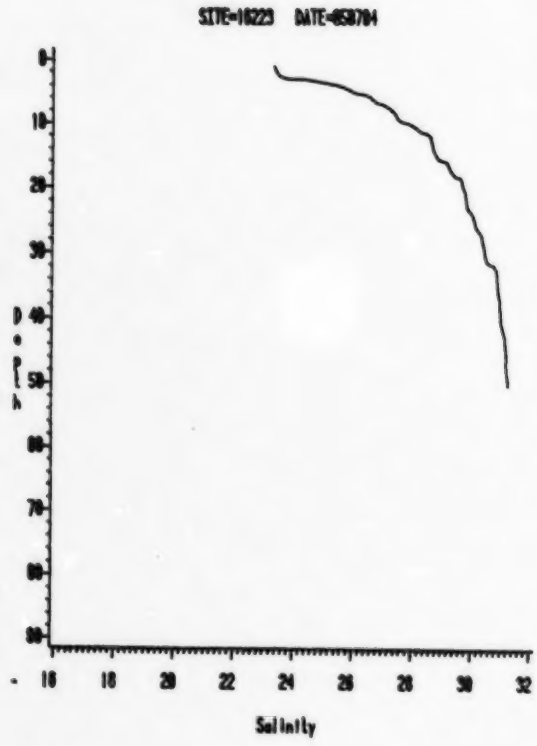
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

a.


SITE=10223 DATE=850704
Depth
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60
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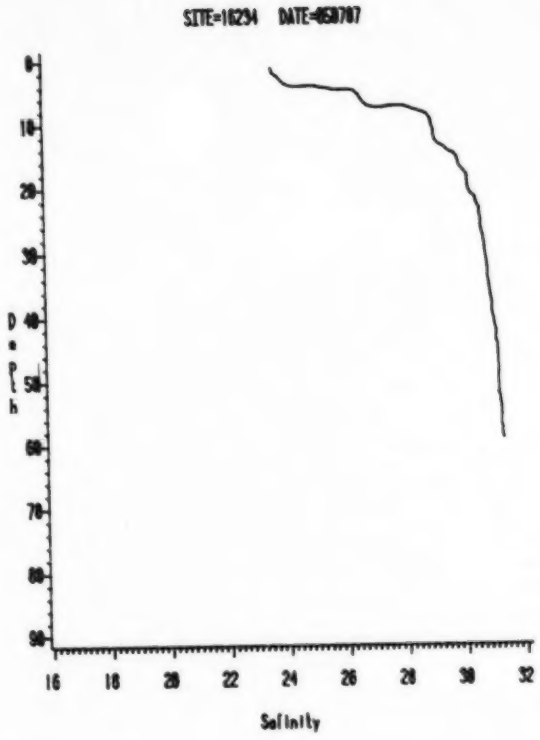
90
16
18
20
22
24
26
28
30
32
Salinity

r.


SITE=16234 DATE=850707
Depth
0
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30
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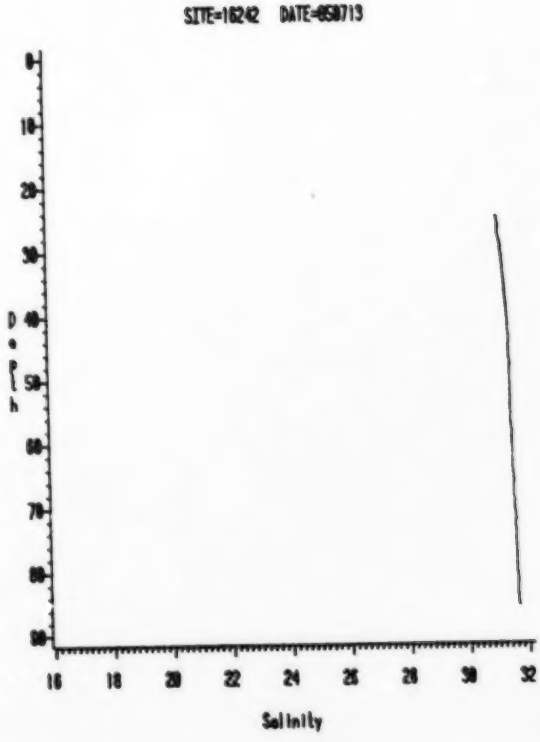
50
60
70
80
90
16
18
20
22
24
26
28
30
32
Salinity

s.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Depth
0
10
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40
50
60
70
80
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18
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22
24
26
28
30
32
Salinity

t.

Appendix 1. Descriptions of codes for weather conditions, sea state, surface current, and tide used in Appendix 2.

Code	Description
a) weather conditions	
1	bright
2	dull or overcast
3	variable
4	dark
b) sea state	
1	calm
2	rippled
3	0.5 m chop
4	1.0 m chop
5	1.5 m chop
6	swell
c) surface current	
1	nil
2	weak
3	moderate
4	strong
d) tide	
	code as hours from low slack on a scale of -5 (one hour after high slack) to 0 (low slack) to +6 (high slack)

Appendix 2. Data record summary for jigging with angling gear. Columns are record number, date, site number, start time for record, minimum depth, maximum depth, median depth, weather conditions (W), sea state (S), surface current (C), tide (TI), total time fishing (EFF), and the number of each species caught. Fishing time is a sum based on three lines in the water unless otherwise noted. Codes for weather conditions, sea state, surface current and tide are described in Appendix 1. DF dogfish, Squalus acanthias; SG silvergrey rockfish, Sebastes brevispinis; CO copper rockfish, S. caurinus; GS greenstriped rockfish, S. elongatus; QB quillback rockfish, S. maliger; YE yelloweye rockfish, S. ruberrimus; KG kelp greenling, Hexagrammos decagrammus; LC lingcod, Ophiodon elongatus, BS butter sole, Isopsetta isolepis; RS rock sole, Lepidopsetta bilineata; YS yellowfin sole, Limanda aspera.

REC	DATE	SITE	TIME	MIN	MAX	MED	W	S	C	TI	EFF	SPECIES									
				(h)	(h)	(h)					(h)	DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS
1[a]	850611	15-121	1220	10	40	25	2	2	2	+5	1.00	3	0	8	0	1	0	0	0	0	0	0
2[a]	850611	15-121	1320	10	40	25	2	1	2	+6	0.95	2	0	1	0	1	0	0	1	0	0	0
3	850611	15-121	1430	10	40	25	2	2	2	+6	1.00	0	0	1	0	3	1	0	1	0	0	0
4	850611	15-121	1520	41	70	55	2	1	2	-5	1.00	1	0	0	0	0	0	0	0	0	0	0
5	850612	15-121	0815	71	100	85	2	2	2	00	0.90	1	0	0	0	0	0	0	0	0	0	0
6	850612	15-121	0900	41	70	55	2	2	2	00	0.80	8	0	0	1	1	0	0	0	0	0	0
7	850612	15-121	1050	41	70	55	2	2	2	+1	0.75	5	0	0	0	0	0	0	0	0	0	0
8	850612	15- 56	1252	10	40	25	2	2	2	+3	0.95	0	0	0	0	0	0	0	0	0	0	0
9	850612	15- 56	1330	41	70	55	2	2	1	+4	0.80	1	0	0	0	1	0	0	0	0	0	0
10	850612	15- 56	1415	71	100	85	1	1	2	+5	0.90	2	0	0	0	3	3	0	0	0	0	0
11	850612	15- 56	1640	10	40	25	2	3	2	-5	0.90	0	0	3	0	1	3	0	2	0	0	0
12	850613	15- 56	0900	71	100	55	2	1	1	00	0.95	0	0	0	0	3	0	0	0	0	0	0
13	850613	15- 56	1015	41	70	55	2	1	1	00	0.85	4	0	0	0	2	7	0	0	0	0	0
14	850613	15- 27	1400	71	100	55	2	1	2	+3	0.85	4	0	0	0	0	2	0	0	0	0	0
15	850613	15- 27	1505	41	70	55	3	3	4	+5	0.95	0	0	0	0	1	2	0	0	0	0	0
16	850614	15- 88	1332	10	30	20	2	2	2	+4	0.60	0	0	2	0	0	0	0	0	0	0	0
17	850614	15- 88	1357	10	15	12	3	2	2	+4	0.75	0	0	0	0	0	0	0	0	0	0	2
18	850614	15- 88	1443	10	20	12	3	2	3	+5	0.85	2	0	7	0	0	0	0	0	0	0	0
19[b]	850614	15-103	1617	40	50	45	3	4	3	+5	0.65	0	0	0	0	2	2	0	0	0	0	0
20[a]	850615	15- 60	0900	18	35	22	1	2	2	-1	0.50	2	0	0	0	0	0	0	0	0	0	0
21	850615	15- 60	0915	46	64	49	1	2	3	-1	0.75	0	0	0	0	0	3	0	0	0	0	0
22	850615	15- 60	1018	75	95	80	1	2	2	00	0.60	0	0	0	0	3	4	0	0	0	0	0
22	850615	15- 60	1018	75	95	80	2	2	2	00	0.60	1	0	0	0	0	0	0	0	0	0	0
23[b]	850615	15-103	1315	45	70	55	1	2	2	+3	0.75	0	0	0	0	1	3	0	0	0	0	0
24	850615	15-103	1415	10	38	22	1	2	2	+3	0.65	0	0	3	0	2	0	0	1	0	0	0
25	850615	15-103	1455	15	36	20	2	2	2	+4	0.80	0	0	6	0	1	0	0	1	0	0	0
26[d]	850615	15-103	1532	71	100	80	1	1	2	+4	0.50	1	0	0	0	1	1	0	0	0	0	0
27	850610	15- 6	0818	12	18	15	2	1	1	-2	0.55	0	0	1	0	0	0	0	0	0	0	0
28	850616	15- 6	0841	48	64	58	1	1	1	-2	0.60	0	0	0	0	0	2	0	0	0	0	0

Appendix 2 (cont'd)

REC	DATE	SITE	TIME	MIN	MAX	MED	W	S	C	TI	EFF	SPECIES										
				(h)	(h)	(h)					(h)	DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS
29	850616	15- 6	0902	74	100	85	1	1	1	-2	0.50	0	0	0	0	0	1	0	0	0	0	0
30	850616	15- 6	0930	8	22	15	1	1	2	-1	0.65	0	0	0	0	0	0	0	1	0	0	0
31	850616	15- 6	1000	41	64	55	2	2	2	-1	0.50	0	0	0	0	0	0	0	0	0	0	0
32	850616	15- 6	1024	71	90	80	2	1	1	00	0.50	1	0	0	0	0	0	0	0	0	0	0
33	850616	15- 27	1300	13	39	20	1	1	3	+1	0.65	0	0	1	0	0	0	0	1	0	0	0
34[b]	850616	15- 27	1330	12	18	12	1	1	3	+1	0.50	0	0	5	0	0	0	0	2	0	0	0
35	850616	15- 27	1412	41	64	50	1	1	2	+2	0.50	2	0	0	0	1	1	0	0	0	0	0
36	850616	15- 27	1446	80	80	80	1	2	3	+2	0.50	1	0	0	0	0	0	0	0	0	0	0
37	850616	15- 27	1518	12	36	15	2	1	2	+3	0.70	2	0	2	0	1	0	0	0	0	0	0
38	850617	15- 56	0805	8	30	20	1	1	1	-3	0.55	0	0	0	0	0	1	0	0	0	0	0
39	850617	15- 56	0830	42	60	54	1	1	1	-3	0.65	1	0	0	0	0	3	0	0	0	0	0
40	850616	15- 56	0912	72	100	80	1	1	1	-3	0.65	1	0	0	1	0	2	0	0	0	0	0
41	850616	15- 56	0945	18	18	18	1	1	1	-2	0.75	0	0	2	0	0	1	0	0	0	0	0
42	850617	15- 56	1025	48	55	50	1	1	1	-1	0.60	1	0	0	0	4	2	0	0	0	0	0
43[a]	850617	15- 60	1240	12	18	15	1	1	1	+1	0.80	2	0	2	0	1	0	0	0	0	0	0
44	850617	15- 60	1307	41	70	50	1	1	1	+1	0.55	2	0	0	0	0	2	0	0	0	0	0
45	850617	15- 60	1400	71	100	85	1	1	1	+2	0.45	5	0	0	0	0	0	0	0	0	0	0
46	850617	15- 60	1448	15	24	20	1	1	1	+2	0.65	3	0	0	0	0	0	0	1	0	0	0
47	850617	15- 60	1523	66	70	68	1	1	1	+2	0.55	4	0	0	0	1	5	0	0	0	0	0
48	850617	15- 60	1600	74	84	80	1	1	1	+3	0.55	0	0	0	0	0	0	0	0	0	0	0
49	850618	15- 27	0805	41	70	48	1	2	2	-3	0.55	0	0	0	0	2	1	0	0	0	0	0
50	850618	15- 27	0833	71	100	84	1	2	2	-3	0.70	2	0	0	0	2	0	0	0	0	0	0
51	850618	15- 27	0927	10	33	15	2	1	1	-2	0.65	0	0	3	0	0	0	0	0	0	0	0
52	850618	15- 27	1002	41	70	60	1	1	1	-2	0.65	0	0	0	0	0	1	1	0	0	0	0
53	850618	15- 6	1304	10	39	15	1	2	3	00	0.70	1	0	0	0	0	0	0	1	0	0	0
54	850618	15- 6	1340	41	70	50	1	3	3	+1	0.50	0	0	0	0	4	1	0	0	0	0	0
55[b]	850618	15- 6	1427	74	100	85	2	3	3	+1	0.65	0	0	0	0	0	0	0	0	0	0	0
56	850618	15- 6	1500	10	35	12	1	2	3	+2	0.95	0	0	0	0	0	0	0	0	0	0	0
57[c]	850619	15-103	0757	71	100	80	1	2	3	-3	0.25	6	0	0	1	0	0	0	0	0	0	0
58	850619	15-103	0848	10	40	15	1	1	2	-3	0.65	0	0	4	0	3	1	1	6	0	0	0
59	850619	15-103	0930	41	70	54	1	2	3	-3	0.70	0	0	0	1	0	1	0	0	0	0	0
60	850619	15-103	1020	71	100	80	1	2	4	-2	0.55	1	0	0	0	0	3	0	0	0	0	0
61	850619	15-103	1150	10	40	25	1	1	3	-1	0.65	0	0	6	0	0	1	0	0	0	0	0
62[b]	850619	15-103	1235	41	70	50	1	2	3	00	0.55	0	0	0	0	0	0	0	0	0	0	0
63	850619	15- 88	1330	6	18	12	1	2	4	+1	0.55	0	0	1	0	0	0	0	0	0	0	0
64[b]	850619	15- 88	1355	8	39	12	1	2	4	+1	0.50	0	0	2	0	0	0	0	0	0	0	0
65	850620	15- 60	0820	10	30	18	1	2	2	-4	0.75	0	0	3	0	0	0	0	0	0	0	0

Appendix 2 (cont'd)

REC	DATE	SITE	TIME	MIN	MAX	MED	W	S	C	TI	EFF	SPECIES										
				(h)	(h)	(h)					(h)	DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS
66	850620	15- 60	0857	42	68	60	1	6	1	-3	0.75	2	0	0	0	0	0	0	0	0	0	0
67	850620	15- 60	0944	71	100	85	1	1	1	-3	0.75	0	0	0	1	0	2	0	0	0	0	0
68	850620	15- 60	1036	41	70	55	1	6	1	-2	0.60	0	0	0	0	0	3	0	0	0	0	0
69	850703	16-242	0902	6	24	12	1	3	3	-3	0.60	0	0	0	0	0	0	0	0	1	0	0
70[b]	850703	16-242	0925	42	46	44	1	3	4	-3	0.50	0	0	0	0	0	0	0	0	0	0	0
71	850703	16-242	0954	8	9	9	3	3	3	-2	0.55	0	0	0	0	0	0	0	0	0	0	0
72[b]	850703	16- 73	1100	9	15	12	1	3	4	-1	0.70	3	0	2	0	0	0	0	1	0	0	0
73[b]	850703	16- 73	1145	8	27	15	1	3	4	-1	0.75	3	0	0	0	0	0	0	3	0	0	0
74[b]	850703	16- 73	1231	41	70	50	1	3	3	00	0.55	0	0	0	0	2	1	0	0	0	0	0
75[b]	850703	16- 73	1326	42	70	56	1	3	4	+1	0.70	0	0	0	0	0	0	0	0	0	0	0
76	850704	16-223	0912	8	40	20	1	2	3	-3	0.75	1	0	8	0	4	0	0	1	0	0	0
77	850704	16-223	0950	45	54	48	1	2	3	-2	0.90	1	0	0	0	1	0	0	0	0	0	0
78	850704	16-223	1103	12	40	15	1	2	4	-2	0.80	0	0	6	0	0	0	0	1	0	0	0
79	850704	16-223	1154	41	70	54	1	2	3	-1	0.60	0	0	0	0	1	0	0	0	0	0	0
80	850705	16-102	0833	72	90	75	2	1	1	-5	0.55	0	0	0	0	1	1	0	1	0	0	0
81	850705	16-102	0910	41	55	48	3	1	1	-4	0.65	0	0	0	0	1	0	0	1	0	0	0
82	850705	16-102	0943	12	30	15	3	2	3	-4	0.65	0	0	1	0	1	1	0	0	0	0	0
83[b]	850705	16-113	1044	10	24	15	3	2	4	-3	0.55	0	0	1	0	0	0	0	0	0	0	0
84	850706	16-168	0827	42	70	50	1	1	2	+6	0.75	1	0	0	0	1	0	0	1	0	0	0
85	850706	16-168	0907	71	100	84	1	1	2	-5	0.60	0	0	0	1	1	0	0	0	0	0	0
86	850706	16-168	0940	10	40	25	1	1	2	-4	0.65	0	0	2	0	5	1	0	1	0	0	0
87	850706	16-168	1014	41	55	50	1	1	2	-4	0.55	0	1	0	0	0	0	0	0	0	0	0
88	850706	16-166	1215	41	60	45	1	2	3	-3	0.75	0	0	0	1	0	4	0	0	0	0	0
89	850706	16-166	1300	71	100	85	1	3	3	-2	0.55	0	0	0	0	0	1	0	0	0	0	0
90	850706	16-166	1345	19	36	24	1	3	3	-1	0.70	1	0	0	0	1	0	0	0	0	0	0
91	850707	16-234	0734	71	78	74	1	1	2	+5	0.70	1	0	0	2	7	0	0	0	0	0	0
92	850707	16-234	0824	41	54	48	1	1	2	+6	0.60	0	0	0	0	0	0	0	0	0	0	0
93	850707	16-234	0854	12	38	25	1	1	2	+6	0.70	0	0	0	0	3	0	0	0	0	0	0
94	850707	16-234	1005	7	40	24	1	2	2	-5	0.70	0	0	0	0	8	0	0	2	0	0	0
95	850707	16-234	1055	71	100	80	1	2	3	-5	0.60	0	0	0	0	2	0	0	0	0	0	0
96	850707	16-234	1130	41	70	50	1	2	3	-4	0.65	1	0	0	0	0	0	0	1	1	0	0
97	850707	16-201	1303	10	30	15	1	2	4	-3	0.60	0	0	0	0	0	0	0	1	0	0	0
98	850707	16-201	1335	5	30	15	1	2	4	-3	0.55	1	0	4	0	0	0	1	0	0	0	0
99	850708	16-223	0833	71	100	86	1	1	3	+5	0.65	0	0	0	0	0	0	0	0	0	0	0
100	850708	16-216	0937	71	100	78	1	1	1	+6	0.65	0	0	0	0	3	3	0	0	0	0	0
101	850708	16-216	1025	41	66	50	1	1	2	+6	0.70	0	0	0	0	0	0	0	0	0	0	0
102	850708	16-216	1050	10	40	24	1	1	1	-5	0.65	0	0	0	0	0	1	0	1	0	0	0
103	850708	16-216	1119	71	100	84	1	1	2	-5	0.60	0	0	0	0	4	3	0	1	0	0	0
104	850708	16-216	1250	41	60	48	1	2	2	-4	0.75	0	0	0	0	2	1	0	0	0	0	0

Appendix 2 (cont'd)

REC	DATE	SITE	TIME	MIN	MAX	MED	W	S	C	TI	EFF	SPECIES										
				(h)	(h)	(h)					(h)	DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS
103	850708	16-216	1119	71	100	84	1	1	2	-5	0.60	0	0	0	0	4	3	0	1	0	0	0
104	850708	16-216	1250	41	60	48	1	2	2	-4	0.75	0	0	0	0	2	1	0	0	0	0	0
105	850708	16-216	1323	10	30	20	1	2	2	-3	0.70	0	0	1	0	1	0	0	0	0	0	0
106[b]	850709	16- 73	1045	41	48	45	1	2	4	-5	0.02	0	0	0	0	1	0	0	0	0	0	0
107[b]	850709	16- 73	1055	10	40	25	1	3	4	-5	0.70	0	0	1	0	1	0	0	0	1	0	0
108[b]	850709	16-201	1223	10	40	25	1	2	4	-2	0.75	0	0	2	0	4	0	1	0	0	0	0
109[b]	850709	16-201	1258	41	70	66	1	2	3	-2	0.60	0	0	0	0	0	0	0	0	0	0	0
110[b]	850709	16-201	1345	10	40	24	1	2	4	-1	0.70	0	0	0	0	0	0	0	3	0	0	0
111	850710	16- 73	0848	71	84	78	1	1	2	+5	0.70	2	0	0	0	2	3	0	0	0	0	0
111	850710	16- 73	0848	71	84	78	1	1	2	-1	0.70	0	0	0	0	3	1	0	0	0	0	0
112	850710	16- 73	0937	41	68	60	1	1	2	00	0.75	5	0	0	0	4	0	0	0	0	0	0
113	850710	16- 73	1035	71	79	78	1	2	2	+1	0.65	3	0	0	0	3	2	0	0	0	0	0
114	850711	16-166	0824	71	100	78	1	1	2	00	0.80	2	0	0	0	3	0	0	0	0	0	0
115	850711	16-166	0925	41	60	54	1	1	2	+1	0.60	0	0	0	0	1	0	0	3	0	0	0
116	850711	16-166	0957	10	36	24	1	1	2	+2	0.65	1	0	0	0	0	0	0	2	0	0	0
117	850711	16-166	1038	78	100	84	1	1	2	+2	0.75	0	0	0	0	1	1	0	0	0	0	0
118	850711	16-166	1110	41	70	55	1	1	2	+3	0.65	0	0	0	0	0	2	0	0	0	0	0
119	850711	16-166	1145	12	40	25	1	1	2	+3	0.55	0	0	0	0	1	1	0	3	0	0	0
120	850711	16-168	1311	10	40	30	1	3	4	+4	0.65	0	0	0	0	0	1	0	1	0	0	0
121[d]	850713	16-242	0844	5	18	10	1	3	3	00	0.65	0	0	0	0	0	0	0	0	0	0	0
122	850713	16-242	0910	42	70	50	1	3	3	00	0.50	0	0	0	0	0	0	0	0	0	0	0
123	850713	16-242	0944	71	100	80	1	3	3	00	0.60	1	0	0	0	0	0	0	0	0	0	0
124	850713	16-242	1017	5	30	7	1	3	3	00	0.70	0	0	2	0	0	0	0	0	0	1	0
125	850713	16-242	1044	41	70	55	1	3	3	+1	0.00	1	0	1	0	0	0	0	0	0	0	0
126	850714	16-113	0812	18	40	30	1	3	3	-2	0.60	2	0	0	0	0	0	0	0	0	1	0
127	850714	16-113	0840	41	70	55	1	3	4	-1	0.45	0	0	0	0	0	1	0	0	0	0	0
128	850714	16- 73	1015	71	100	78	1	3	2	00	1.15	2	0	0	1	13	3	0	0	0	0	0
129	850714	16-234	1245	10	40	18	1	3	4	+3	0.90	0	0	0	0	3	0	0	2	0	0	0
130	850715	16-223	1150	18	24	20	1	2	3	+2	0.70	0	0	0	0	0	0	0	1	0	0	0
131	850715	16-223	1213	14	24	17	1	2	2	+2	0.70	0	0	6	0	1	0	0	1	0	1	0
132	850715	16-223	1250	78	90	80	1	2	2	+3	0.70	0	0	0	1	1	1	0	0	0	0	0
133	850715	16-223	1330	78	96	78	1	2	2	+4	0.95	1	0	0	2	3	0	0	0	0	0	0
134	850715	16-223	1435	41	48	48	1	2	2	+5	0.70	0	0	0	0	0	0	0	0	0	0	0
135	850716	16-216	0825	79	90	90	1	2	3	-3	0.70	0	0	0	0	1	1	0	0	0	0	0
136	850716	16-216	0906	41	70	54	1	2	3	-2	0.70	0	0	0	3	1	4	0	0	0	0	0
137	850716	16-216	1010	5	40	20	1	2	3	-1	0.90	0	0	0	0	0	0	0	1	0	0	0
138	850717	16-166	0820	71	90	75	1	1	2	-4	0.80	2	0	0	0	2	5	0	0	0	0	0

Appendix table 2 (cont'd)

REC	DATE	SITE	TIME	MIN	MAX	MED	W	S	C	TI	EFF	SPECIES										
				(h)	(h)	(h)					(h)	DF	SG	CO	GS	QB	YE	KG	LC	BS	RS	YS
139	850717	16-166	0938	71	95	78	1	1	2	-2	0.65	0	1	0	0	1	1	0	0	0	0	0
140	850717	16-166	1044	41	63	54	1	2	3	-1	0.80	0	0	0	0	1	2	0	0	0	0	0
141	850717	16-166	1136	18	40	24	1	2	3	00	0.75	0	0	0	0	0	0	0	0	0	0	0
142	850718	16-234	1003	41	70	54	1	1	3	-3	0.80	0	0	0	1	1	1	0	0	0	0	0
143	850718	16-234	1040	71	80	80	1	1	3	-3	0.80	0	0	0	1	0	0	0	0	0	0	0
144	850718	16-242	1215	80	90	85	1	1	2	00	1.00	0	0	0	0	1	0	0	0	0	0	0
145[e]	850904	16-113	0859			15	2	2	1	+5	0.67	4	0	0	0	0	0	2	0	0	0	0
146[e]	850904	16-113	0944	41	70	50	2	2	2	+6	1.20	4	0	0	0	1	0	0	1	0	0	0
147[e]	850904	16-113	1035			15	2	1	2	-5	0.67	6	0	0	0	0	0	1	0	0	0	0
148[e]	850904	16-113	1135			15	2	1	1	-4	1.47	4	0	0	0	0	0	0	2	0	0	0
149[e]	850904	16-113	1224	55	65	60	2	1	1	-4	0.93	0	0	0	0	3	2	0	0	0	0	0
150[e]	850904	16-102	0840	7	40	25	2	1	2	+5	0.73	3	0	1	0	0	1	0	0	0	0	0
151[e]	850904	16-102	0925	7	40	30	2	1	2	+6	0.70	0	0	2	0	2	0	1	0	0	0	0
152[e]	850904	16-102	1015	41	70	60	2	1	1	+6	0.67	0	0	0	0	3	0	1	0	0	0	0
153[e]	850904	16-102	1110	41	70	50	2	1	1	-5	0.73	0	0	0	0	0	1	0	1	0	0	0

[a] seals in area

[b] drifting, angle on lines

[c] dogfish, set aborted

[d] anchor set

[e] only two lines in water, no sounder

Appendix 3a. Codes used to describe rockfish maturity stages, from Nagtegaal and Farlinger (1980), based on maturity stages described by Westrheim (1975).

Maturity	Code	Gonad condition
	0	Unknown
	1	Immature (translucent;males,stringlike;females small)
Females	2	Maturing (small, yellow eggs; translucent or opaque)
	3	Mature (large, orange-yellow eggs; opaque)
	4	Fertilized (large, orange-yellow eggs; translucent)
	5	Embryos or larvae (include eyed eggs)
	6	Spent (large, flaccid, red ovaries. a few larvae may be present)
	7	Resting (moderate size, firm, red-grey ovaries)
	8	Resorbing
Males	2	Maturing (stringlike, translucent, white)
	3	Developing (swelling, brown-white)
	4	Developed (large, white; easily broken)
	5	Running (running sperm)
	6	Spent (flaccid, red)
	7	Resting (ribbon-like; small, brown)

Appendix 3b. Codes used to describe lingcod maturity stages, modified from Cass et al. (1984).

Maturity	Code	Gonad condition
	0	Unknown
	1	Immature; (males stringlike; females small)
	2	Immature; (males flat, transparent and slightly enlarged; females, slightly enlarged)
Females	3	Ova are semi-transparent and less than 1 mm in diameter, ovaries fill one-third of the body cavity
	4	Ova are opaque and about 1 mm in diameter, ovaries fill two thirds of the body cavity
	5	Ova are less than 2 mm in diameter, ovaries fill 80% of body cavity
	6	Ova are about 2 mm in diameter
	7	Ripe (ova are larger than 2 mm in diameter, ovaries visibly fill and distend body cavity)
	8	Spent (ovary may be bloodshot and purple in colour, ovary is flaccid and about one-third to two-thirds of the body cavity)
	9	Resorbing (ova are large to opaque and degenerative)
	10	Recovering (ovaries returning to pre-ripening stage (code 3) ovaries are firm and fill less than half the body cavity, ova are small)
	11	Resting (ovaries fill less than one-third of the body cavity, no ova present)
Males	3	Testes enlarged, filling less than one-quarter of the body cavity and white to brown in colour
	4	Testes enlarged to two-thirds of the body cavity, cross-sections of the gonad will produce milt
	7	Ripe (testes are large and full of milt)
	8	Spent (testes are flaccid, reduced in size and may contain some milt)
	11	Resting (testes are less than one-third of the body cavity, usually brown in colour and devoid of milt)

Appendix 4. Date, site number, depth, sex, fork length (mm), weight (g), maturity and fish number for landed catch. Data are sorted by species, sex and length. For sex, 1=male, 2=female. Maturity codes are described in Appendix 3. A fish number indicates that otoliths (rockfish) or fin rays (lingcod) were collected.

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
a) silvergrey rockfish							
850717	16-166	78	1	451	1350	2	
850706	16-168	50	2	436	1060	2	
b) copper rockfish							
850703	16- 73	12	1	193	150	1	4464
850619	15-103	25	1	196	140	1	4452
850704	16-223	15	1	203	150	2	4474
850904	16-102	25	1	207	180	1	6023
850612	15- 56	25	1	208	275	2	4411
850706	16-168	25	1	210	175	2	4483
850619	15-103	25	1	211	190	7	4453
850615	15-103	22	1	213	200	1	4423
850619	15-103	25	1	213	175	2	4454
850615	15-103	22	1	217	200	1	4425
850616	15- 27	12	1	219	190	1	4434
850614	15- 88	20	1	222	200	1	4414
850619	15- 88	12	1	223	180	7	4448
850615	15-103	20	1	227	240	1	4426
850616	15- 27	12	1	231	200	7	4437
850715	16-223	17	1	233	220	2	4496
850704	16-223	15	1	234	200	7	4473
850618	15- 27	15	1	235	200	2	4445
850620	15- 60	18	1	237	250	7	4461
850707	16-201	15	1	239	225	7	4485
850615	15-103	20	1	243	265	7	4427
850705	16-102	15	1	246	240	2	4481
850615	15-103	20	1	249	275	7	4429
850704	16-223	15	1	249	280	7	4472
850616	15- 27	12	1	251	230	7	4436
850616	15- 27	15	1	252	285	7	4439
850616	15- 56	18	1	252	250	2	4441
850715	16-223	17	1	256	300	2	4497
850616	15- 56	18	1	258	300	7	4442
850619	15- 88	12	1	258	300	7	4449

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850619	15- 88	12	1	258	300	7	4449
850612	15- 56	25	1	259	250	2	4412
850618	15- 27	15	1	260	260	7	4446
850904	16-102	30	1	260	290	2	6022
850610	15- 6	15	1	261	280	7	4432
850615	15-103	20	1	262	275	7	4428
850616	15- 27	12	1	262	280	7	4438
850709	16-201	25	1	262	305	2	4491
850705	16-113	15	1	268	275	2	4480
850615	15-103	20	1	269	280	7	4430
850614	15- 88	12	1	275	350	3	4417
850704	16-223	15	1	276	245	7	4476
850619	15-103	25	1	277	350	7	4456
850620	15- 60	18	1	278	325	7	4462
850619	15-103	15	1	279	325	7	4457
850704	16-223	20	1	279	390	7	4467
850617	15- 60	15	1	282	375	7	4444
850704	16-223	20	1	285	350	7	4479
850614	15- 88	12	1	286	375	3	4416
850704	16-223	20	1	287a	175	2	4469
850614	15- 88	20	1	288	400	3	4415
850715	16-223	17	1	291	405	2	4500
850616	15- 27	15	1	298	380	7	4440
850611	15-121	25	1	300	400	7	4408
850704	16-223	20	1	301	480	7	4478
850611	15-121	25	1	304	460	7	4409
850619	15- 88	12	1	306	475	7	4450
850713	16-242	7	1	314	575	2	4492
850715	16-223	17	1	316a	205	2	4495
850614	15- 88	12	1	343a	260	3	4418
850611	15-121	25	1	385	850	7	4403
850619	15-103	25	2	190	150	1	4451
850706	16-168	25	2	194	140	2	4482
850614	15- 88	12	2	206	165	1	4422
850616	15- 27	20	2	206	190	2	4433
850614	15- 88	12	2	216	190	7	4421
850704	16-223	15	2	225	185	2	4475
850614	15- 88	12	2	226	220	7	4420

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850708	16-216	20	2	226	175	2	4488
850704	16-223	20	2	228	245	6	4468
850709	16-201	25	2	231	200	2	4490
850616	15- 27	12	2	232	225	1	4435
850615	15-103	22	2	233	165	1	4424
850707	16-201	15	2	234	225	2	4487
850704	16-223	20	2	236	225	6	4470
850704	16-223	20	2	237	260	2	4466
850703	16- 73	12	2	246	225	7	4465
850618	15- 27	15	2	247	225	7	4447
850904	16-102	30	2	250	290	2	6021
850619	15-103	25	2	251	225	7	4455
850612	15- 56	25	2	255	250	2	4413
850614	15- 88	12	2	256	280	7	4419
850704	16-223	20	2	256	255	6	4471
850617	15- 60	15	2	257	275	2	4443
850704	16-223	15	2	261	325	6	4477
850715	16-223	17	2	261	345	2	4498
850707	16-201	15	2	262	340	2	4486
850715	16-223	17	2	276	350	2	4499
850611	15-121	25	2	280	360	7	4405
850619	15-103	15	2	281	325	7	4458
850619	15-103	15	2	290	350	7	4459
850611	15-121	25	2	292	365	7	4404
850620	15- 60	18	2	297	375	2	4463
850615	15-103	20	2	305	440	7	4431
850707	16-201	15	2	307	490	2	4484
850611	15-121	25	2	317	560	7	4410
850619	15-103	15	2	319	525	7	4460
850611	15-121	25	2	320	500	7	4402
850709	16- 73	25	2	322	580	7	4489
850611	15-121	25	2	326	580	7	4407
850713	16-242	7	2	345	775	2	4493
850611	15-121	25	2	348	600	7	4406
850611	15-121	25	2	380	765	7	4401
850713	16-242	55	2	447	1660	7	4494

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
c) greenstriped rockfish							
850716	16-216	54	1	225	256	7	
850716	16-216	54	1	230	175	7	
850707	16-234	74	1	254	225	7	
850612	15-121	55	1	335	550	7	
850714	16- 73	78	2	204	110	2	
850620	15- 60	85	2	221	160	7	
850616	15- 56	80	2	230	175	1	
850706	16-168	84	2	234	200	1	
850619	15-103	80	2	244	225	2	
850706	16-166	45	2	245	200	1	
850716	16-216	54	2	245	252	7	
850718	16-234	54	2	253	250	7	
850715	16-223	80	2	267	275	7	
850619	15-103	54	2	275	290	2	
850718	16-234	80	2	288	310	7	
850715	16-223	78	2	295	375	7	
850707	16-234	74	2	300	450	7	
850715	16-223	78	2	304	430	7	
d) quillback rockfish							
850707	16-234	25		325	640		4272
850617	15- 60	15	1	190	150	1	4229
850707	16-234	24	1	205	160	2	
850706	16-168	25	1	208	190	2	4260
850706	16-168	25	1	221	180	2	4261
850706	16-168	25	1	232	225	2	4262
850617	15- 56	50	1	238	290	1	4230
850707	16-234	74	1	246	290	2	4275
850618	15- 27	48	1	247	250	2	4235
850715	16-223	17	1	247	320	7	4333
850709	16-201	25	1	248	280	7	4295
850704	16-223	20	1	251	280	7	4251
850904	16-102	60	1	251	270	1	6043
850612	15-121	55	1	256	225	1	4207
850707	16-234	24	1	261	340	1	4265
850904	16-113	60	1	270	325	2	6048
850716	16-216	54	1	281	320	7	4338

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850612	15- 56	25	1	287	375	2	4211
850707	16-234	24	1	288	430	2	4269
850904	16-102	30	1	291	475	2	6042
850703	16- 73	50	1	296	490	7	4246
850714	16- 73	78	1	299	520	7	4320
850707	16-234	24	1	303	540	7	4267
850716	16-216	90	1	307	530	7	4339
850706	16-166	24	1	308	465	2	4263
850711	16-166	54	1	309	540	1	4312
850619	15-103	15	1	311	525	7	4243
850619	15-103	15	1	317	540	7	4244
850617	15- 56	50	1	319	575	7	4232
850715	16-223	80	1	321	575	7	4334
850707	16-234	24	1	324	650	7	4273
850904	16-102	60	1	326	640	3	6044
850714	16- 73	78	1	327	700	7	4325
850714	16-234	18	1	328	620	7	4319
850613	15- 56	55	1	330	725	7	4216
850714	16- 73	78	1	331	700	7	4330
850618	15- 27	84	1	332	610	7	4238
850706	16-168	84	1	332	720	7	4264
850707	16-234	74	1	332	630	1	4277
850711	16-166	78	1	332	650	7	4314
850708	16-216	84	1	334	880	7	4292
850617	15- 60	68	1	335	625	7	4234
850615	15-103	20	1	336	625	7	4227
850718	16-234	54	1	336	750	7	4345
850904	16-113	50	1	337	600	7	6046
850714	16- 73	78	1	341	770	7	4322
850618	15- 6	50	1	342	690	7	4241
850611	15-121	25	1	343	560	7	4205
850714	16- 73	78	1	343	770	7	4328
850904	16-102	60	1	343	780	3	6045
850703	16- 73	50	1	345	670	7	4247
850715	16-223	78	1	345	755	7	4336
850617	15- 56	50	1	346	780	7	4231
850711	16-166	78	1	346	825	7	4315
850615	15- 60	80	1	348	675	7	4221

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850715	16-223	78	1	348	720	7	4335
850710	16- 73	78	1	349	730	7	4300
850708	16-216	84	1	350	800	7	4291
850618	15- 6	50	1	351	775	7	4242
850708	16-216	84	1	351	790	7	4290
850710	16- 73	78	1	352	790	7	4299
850715	16-223	78	1	354	800	7	4337
850618	15- 6	50	1	355	690	7	4239
850707	16-234	74	1	356	800	7	4279
850708	16-216	48	1	356	800	7	4285
850714	16- 73	78	1	356	905	7	4331
850710	16- 73	78	1	359	850	7	4302
850711	16-166	78	1	359	875	7	4313
850704	16-223	54	1	360	785	7	4253
850710	16- 73	60	1	362	840	7	4308
850714	16- 73	78	1	364	925	7	4321
850613	15- 56	55	1	368	760	7	4212
850615	15- 60	80	1	368	750	7	4220
850619	15-103	15	1	368	850	7	4245
850613	15- 56	55	1	375	1000	7	4214
850613	15- 56	55	1	375	765	7	4215
850615	15-103	55	1	375	975	7	4223
850714	16-234	18	1	375[a]	360	2	4318
850710	16- 73	78	1	378	850	7	4306
850612	15- 56	85	1	380	825	7	4208
850710	16- 73	60	1	381	975	7	4309
850710	16- 73	78	1	381	860	7	4305
850714	16- 73	78	1	383	850	7	4323
850709	16-201	25	1	384[a]	415	7	4297
850613	15- 56	55	1	389	950	7	4213
850618	15- 6	50	1	394	1050	7	4240
850616	15- 27	15	1	395	1150	1	4635
850707	16-234	80	1	483[a]	1000	7	4281
850707	16-234	74	2	174	135	2	4274
850612	15- 56	55	2	186	100	1	4206
850904	16-102	30	2	195	175	1	6041
850706	16-168	25	2	211	165	2	4257
850705	16-102	75	2	221	190	2	4254

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850706	16-168	50	2	226	215	2	4258
850704	16-223	20	2	236	230	2	4248
850704	16-223	20	2	242	250	2	4250
850615	15-103	22	2	244	275	2	4225
850705	16-102	48	2	245	230	2	4255
850614	15-103	45	2	252	275	7	4218
850710	16- 73	78	2	256	300	2	4301
850706	16-168	25	2	258	330	2	4259
850704	16-223	20	2	269	320	2	4249
850711	16-166	25	2	273	390	7	4311
850614	15-103	45	2	274	290	7	4219
850709	16-201	25	2	279	370	7	4296
850707	16-234	24	2	284	440	7	4266
850717	16-166	75	2	286	475	2	4341
850708	16-216	78	2	287	460	7	4286
850714	16-234	18	2	303	524	7	4317
850618	15- 27	48	2	304	390	2	4236
850708	16-216	78	2	304	590	7	4288
850616	15- 27	50	2	306	500	1	4228
850707	16-234	24	2	309	540	2	4268
850708	16-216	20	2	309	530	7	4283
850611	15-121	25	2	315	550	7	4203
850717	16-166	78	2	321	675	2	4342
850705	16-102	15	2	324	650	7	4256
850709	16-201	25	2	324	580	7	4298
850611	15-121	25	2	326	550	7	4202
850707	16-234	74	2	326	580	2	4276
850708	16-216	48	2	327	690	7	4284
850709	16- 73	25	2	327	680	7	4294
850711	16-166	84	2	327	775	7	4316
850708	16-216	78	2	329	675	7	4287
850613	15- 27	55	2	330	700	7	4217
850707	16-234	24	2	332	750	7	4270
850708	16-216	84	2	335	700	7	4289
850714	16- 73	78	2	335	693	7	4327
850710	16- 73	60	2	336	675	7	4307
850714	16- 73	78	2	336	700	7	4326

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850618	15- 27	84	2	337	650	7	4237
850704	16-223	48	2	337	600	7	4252
850615	15-103	22	2	338	625	7	4226
850611	15-121	25	2	345	675	7	4201
850615	15-103	80	2	346	800	7	4224
850707	16-234	25	2	346	750	7	4271
850717	16-166	54	2	346	775	7	4343
850707	16-234	74	2	352	900	7	4280
850615	15- 60	80	2	356	830	7	4222
850707	16-234	74	2	359	850	6	4278
850611	15-121	25	2	365	775	7	4204
850714	16- 73	78	2	371	975	7	4332
850617	15- 56	50	2	372	925	7	4233
850904	16-113	60	2	377	940	7	6047
850710	16- 73	78	2	384	890	7	4304
850707	16-234	80	2	386	1200	2	4282
850710	16- 73	78	2	386	990	7	4303
850612	15- 56	85	2	397	950	7	4210
850709	16- 73	45	2	398	1090	7	4293
850714	16- 73	78	2	398	1140	7	4324
850714	16- 73	78	2	398	975	7	4329
850710	16- 73	60	2	405	1090	7	4310
850612	15- 56	85	2	410	950	7	4209
850717	16-166	75	2	482[a]	1100	7	4340
850904	16-113	60	2	675[a]	349	7	6049
850718	16-242	85	2	751[a]	760	7	4346
e) yelloweye rockfish							
850718	16-234	54		303	515		4713
850717	16-166	75	1	178	110	1	4708
850620	15- 60	85	1	204	150	1	4662
850710	16- 73	78	1	254	290	1	4684
850617	15- 56	54	1	267	325	1	4641
850619	15-103	80	1	282	375	1	4657
850904	16-113	60	1	283	380	1	6003
850613	15- 56	55	1	287	425	1	4609
850616	15- 56	80	1	291	500	1	4639
850617	15- 60	68	1	292	480	1	4652

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850613	15- 56	55	1	298	375	1	4612
850611	15-121	25	1	300	400	1	4601
850612	15- 56	25	1	300	400	1	4606
850617	15- 60	68	1	301	550	1	4651
850619	15-103	25	1	307	525	1	4661
850710	16- 73	78	1	308	450	1	4685
850617	15- 56	54	1	309	560	1	4642
850616	15- 6	58	1	311	620	1	4632
850613	15- 56	55	1	320	550	2	4608
850711	16-166	84	1	326	605	1	4694
850615	15- 60	80	1	327	675	1	4625
850717	16-166	75	1	327	640	2	4707
850904	16-102	25	1	328	575	1	6001
850619	15-103	15	1	337	650	2	4660
850620	15- 60	55	1	340	840	1	4665
850617	15- 60	68	1	342	730	1	4649
850615	15-103	55	1	346	650	1	4628
850904	16-102	50	1	349	660	1	6002
850615	15- 60	49	1	363	800	1	4622
850708	16-216	78	1	363	825	1	4676
850617	15- 60	50	1	365	800	1	4647
850706	16-166	45	1	365	720	1	4672
850711	16-166	55	1	366	775	2	4693
850616	15- 56	80	1	368	900	1	4640
850613	15- 56	55	1	370	700	2	4614
850613	15- 56	55	1	374	800	2	4611
850715	16-223	80	1	377	895	1	4699
850620	15- 60	55	1	378	900	1	4664
850620	15- 60	85	1	381	900	7	4663
850615	15- 60	49	1	384	775	1	4621
850619	15-103	54	1	384	1020	1	4656
850714	16- 73	78	1	386	875	1	4697
850617	15- 56	20	1	387	930	7	4637
850708	16-216	78	1	388	1080	1	4678
850616	15- 6	85	1	396	975	1	4633
850618	15- 27	48	1	396	1025	1	4653
850613	15- 27	55	1	397	1000	1	4616
850714	16- 73	78	1	402	1200	1	4696

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850706	16-166	45	1	414	1175	2	4673
850708	16-216	84	1	418	1258	7	4679
850617	15- 60	50	1	425	1350	7	4646
850711	16-166	55	1	432	1325	2	4692
850619	15-103	80	1	441	1325	1	4658
850708	16-216	84	1	441	1375	1	4680
850615	15- 60	49	1	445	1500	7	4623
850614	15-103	45	1	447	1550	2	4620
850710	16- 73	78	1	448	1605	2	4688
850708	16-216	84	1	452	1650	2	4681
850617	15- 60	68	1	460	1650	7	4650
850613	15- 27	55	1	462	1625	7	4616
850617	15- 60	68	1	467	1750	7	4648
850615	15- 60	80	1	471	1700	7	4624
850616	15- 27	50	1	476	1750	7	4636
850904	16-113	60	1	476	1700	2	6004
850708	16-216	48	1	478	1775	2	4682
850710	16- 73	78	1	481	1725	2	4689
850613	15- 27	55	1	487	1900	7	4615
850618	15- 27	60	1	520	2500	7	4654
850619	15-103	80	1	684	5125	7	4659
850615	15-103	80	2	239	225	1	4631
850717	16-166	54	2	240	260	1	4710
850717	16-166	78	2	243	280	2	4712
850616	15- 56	18	2	244	250	2	4638
850613	15- 56	55	2	297	475	1	4610
850612	15- 56	25	2	299	300	1	4605
850617	15- 56	54	2	309	460	2	4643
850613	15- 56	55	2	311	500	2	4613
850618	15- 6	50	2	329	725	2	4655
850617	15- 56	50	2	330	630	7	4644
850711	16-166	25	2	331	670	2	4691
850717	16-166	75	2	331	675	2	4709
850710	16- 73	78	2	345	720	2	4686
850620	15- 60	55	2	346	700	2	4666
850716	16-216	54	2	351	690	2	4700
850617	15- 56	50	2	352	760	2	4645
850612	15- 56	85	2	354	700	7	4603

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850716	16-216	54	2	354	850	2	4702
850717	16-166	54	2	356	850	1	4711
850708	16-216	78	2	358	805	2	4677
850716	16-216	54	2	363	725	2	4701
850705	16-102	15	2	374	810	6	4668
850613	15- 27	55	2	378	850	7	4617
850703	16- 73	50	2	382	925	2	4667
850705	16-102	75	2	385	915	2	4669
850616	15- 6	58	2	388	1050	7	4634
850615	15- 60	80	2	389	840	7	4626
850612	15- 56	25	2	390	1000	2	4607
850716	16-216	90	2	392	980	2	4704
850615	15-103	55	2	398	1050	7	4629
850615	15-103	55	2	406	1175	7	4630
850710	16- 73	78	2	412	1320	2	4687
850612	15- 56	85	2	420	1125	7	4602
850714	16- 73	78	2	421	1140	2	4698
850614	15-103	45	2	426	1275	7	4619
850706	16-166	85	2	431	1300	2	4671
850706	16-168	25	2	434	1275	2	4670
850717	16-166	75	2	448a	700	2	4706
850615	15- 60	80	2	461	1450	7	4627
850706	16-166	45	2	468	1660	7	4674
850708	16-216	24	2	469	1775	7	4683
850612	15- 56	85	2	472	1800	7	4604
850717	16-166	75	2	477a	950	2	4705
850716	16-216	54	2	478a	830	2	4703
850706	16-166	45	2	492	2000	7	4675
850711	16-168	30	2	493	1900	7	4690
850714	16-113	55	2	495	1880	7	4695
f) kelp greenling							
850709	16-201	25	1	328			
850904	16-113	15	2	300			
850904	16-113	15	2	300			
850904	16-102	30	2	308	375	3	
850618	15- 27	60	2	346			
850904	16-113	15	2	350			
850707	16-201	15	2	395			
850904	16-102	60	2	412	1000	3	

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
g) lingcod							
850904	16-113	15	1	350			
850619	15-103	15	1	372		1	25012
850619	15-103	15	1	372		1	25014
850619	15-103	15	1	376		1	25013
850714	16-234	18	1	376		2	27028
850619	15-103	15	1	377		1	25015
850704	16-223	20	1	386			27005
850711	16-166	25	1	386			27025
850617	15- 60	20	1	403	550	1	25010
850612	15- 56	25	1	410		7	25003
850619	15-103	15	1	422			25016
850611	15-121	25	1	423		11	25001
850711	16-166	25	1	435			
850704	16-223	15	1	442			27006
850707	16-201	15	1	442			27014
850703	16- 73	15	1	445		2	27003
850904	16-113	50	1	450			
850619	15-103	15	1	456		11	25017
850703	16- 73	15	1	458		2	27002
850616	15- 27	12	1	460		1	25009
850705	16-102	48	1	461			27007
850708	16-216	24	1	465			27016
850715	16-223	17	1	479			27031
850615	15-103	22	1	480			25005
850708	16-216	84	1	481			27017
850611	15-121	25	1	495		11	25002
850706	16-168	25	1	495			27010
850618	15- 6	15	1	499		11	25011
850703	16- 73	15	1	512		4	27004
850711	16-166	54	1	520			27021
850705	16-102	75	1	522		2	27008
850904	16-113	15	1	539	1390	3	28663
850711	16-166	54	1	552			27020
850904	16-102	50	1	595	2100	3	28662
850709	16-201	24	2	420			27019
850715	16-223	20	2	421		1	27030
850703	16- 73	12	2	427		2	27001

Appendix 4 (cont'd)

DATE	SITE	DEP (m)	SEX	LEN (mm)	WEIGHT (g)	MAT	FISH NO.
850716	16-216	54	2	354	850	2	4702
850615	15-103	20	2	432			25006
850616	15- 27	20	2	444		1	25008
850707	16-234	24	2	449			27011
850711	16-166	24	2	472			27023
850709	16-201	24	2	476			27018
850612	15- 56	25	2	483		3	25004
850714	16-234	18	2	486		2	27029
850716	16-216	20	2	504			27032
850707	16-234	50	2	511			27013
850711	16-166	54	2	520			27022
850706	16-168	50	2	530			27009
850707	16-234	24	2	550			27012
850711	16-168	30	2	550			27027
850711	16-166	25	2	553			27026
850711	16-166	24	2	565			27024
850616	15- 6	15	2	681		11	25007
g) butter sole							
850703	16-242	12	2	303			
850709	16- 73	25	2	309			
850707	16-234	50	2	310			
h) rock sole							
850714	16-113	30	2	311		2	
850713	16-242	7	2	341			
850715	16-223	17	2	369			
i) yellowfin sole							
850614	15- 88	12	2	332			
850614	15- 88	12	2	375			

[a]Error in recording of length or weight, data excluded from analyses.

Appendix 5. Date, sex, fork length (mm), maturity and fish number for fish sampled at Duncan Cove Marina, Garden Bay from the recreational fishery. Data are sorted by species, sex and length. For sex, 1=male, 2=female. Maturity codes are described in Appendix 3. A fish number indicates that otoliths (rockfish) or fin rays (lingcod) were collected.

DATE	SEX	LEN (mm)	MAT	FISH NO.
a) copper rockfish				
850716	1		7	5008
850704	1	222	1	5002
850712	1	265	7	5005
850705	1	311	2	5003
850703	1	323	2	5001
850712	2	250	7	5006
850712	2	263	7	5007
850707	2	328	6	5004
b) quillback rockfish				
850707	1	240	1	5107
850712	1	280	2	5111
850714	1	281	7	5112
850707	1	298	1	5106
850708	1	300	1	5109
850705	1	300	2	5102
850714	1	308	7	5113
850715	1	322	7	5118
850715	1	336	7	5119
850706	1	360	2	5104
850706	1	383	2	5103
850703	1	383	2	5101
850716	1	389	7	5149
850715	2	271		
850715	2	293	7	5121
850715	2	298	2	5120
850715	2	300	7	5122
850715	2	308	7	5115
850706	2	309	7	5105
850715	2	312	7	5117
850708	2	333	7	5108
850715	2	347	7	5116
850709	2	395	7	5110
850714	2	426	7	5114
c) yelloweye rockfish				
850715		305		5183
850715	1	323	1	5184
850709	1	400	1	5181

DATE	SEX	LEN (mm)	MAT	FISH NO.
d) lingcod				
850705		764		8828
850705	1	400		8824
850705	1	432		8826
850705	1	464		8823
850712	1	475		8835
850705	1	500		8822
850705	1	505		8825
850705	1	533		8817
850715	1	534		8801
850715	1	534	11	8807
850705	1	546		8813
850714	1	560		8800
850700	1	562		8836
850705	1	565		8818
850705	1	595		8821
850705	1	601		8830
850715	1	606		8804
850715	1	606	11	8810
850705	1	620		8829
850705	1	626		8819
850708	1	673		8831
850705	2	410		8827
850708	2	432		8833
850708	2	446		8832
850716	2	493		8806
850716	2	493	2	8812
850705	2	530		8816
850715	2	559		8802
850715	2	559	3	8808
850715	2	582		8803
850715	2	582	3	8809
850715	2	594		8805
850715	2	594	3	8811
850705	2	625		8815
850700	2	661		8837
850705	2	681		8814
850707	2	705		8834
850705	2	726		8820